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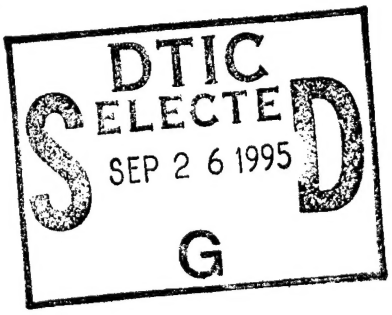

CARTOGRAPHY AND TYPOGRAPHY WITH TRUE BASIC

by

Allen V. Hershey

September 1995

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Monterey, CA 93943-5000

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A home computer can compute if it has BASIC. A showcase of data and programs has been prepared for True BASIC on a Macintosh computer. Cartographic data have been compressed to one fourth of their volume in a previous format, and typographic data have been compressed to one half of their previous volume. The use of the showcase is illustrated by samples of input to computer and output from a Laserjet printer. Listings and disks are available for acquisition by other users.

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ABSTRACT

A home computer can compute if it has BASIC. A showcase of data and programs has been prepared for True BASIC on a Macintosh computer. Cartographic data have been compressed to one fourth of their volume in a previous format, and typographic data have been compressed to one half of their previous volume. The use of the showcase is illustrated by samples of input to computer and output from a Laserjet printer. Listings and disks are available for acquisition by other users.

INTRODUCTION

The quality of printing in 1970 was improved by the preparation of a repertory of data and programs which gave control over the printed output from a computer. The repertory is the basis for the preparation of maps of the United States and the World. The repertory provides for the preparation of printed material in electronics, chemistry, and mathematics. The repertory has been used in the preparation of eleven reports.

Evolution has led to a system which takes a stream of input, processes the input to prepare output, and gives a stream of output. In 1979 the system was transferred to the Computer Center at the Naval Postgraduate School. It has been described in previous reports. The current status of the system is the subject of this report.

In the meantime the frenzy of proliferation of personal computers has led to the transfer of the system to an HP-85 Hewlett-Packard computer and to a Classic II Macintosh computer. Output from the Hewlett-Packard computer goes to an Inkjet printer, while output from the Macintosh computer goes to an HP Laserjet IIIp printer.

Data are stored in data files while programs are stored in program files. Map data are sequential but character data require random access. The storage of character data on tape is out of the question for random access. On the main frame the character data are copied from tape storage into transistor storage where access is at electronic speed. The transistor memory of the Hewlett-Packard computer is too small to hold all of the character data. On the other hand, random access is at disk speed on a disk, and the character data are kept on a disk. The position of each character is listed in an index file while the data for the character are stored in the data file.

On the main frame the language is FORTRAN, while on home computers the language is BASIC. There is Hewlett-Packard BASIC on the HP85 computer, while there is Microsoft BASIC, Quick BASIC, and True BASIC on the Macintosh computer.

There are programs in all four languages which have the same central structure but differ in minor detail at the ends. Programs with the same function in FORTRAN and BASIC are different in detail. There are only capital letters and a few signs in FORTRAN. The computer must be told explicitly what case to use. The characters have ASCII numbers in BASIC. The case is specified by the input.

For a computer to be useful, it must make it easy for the user to enter data and programs. On the main frame the user must wait his turn in the time share queue. On a personal computer the user can watch what happens on a screen.

Unlike other versions of BASIC, the Hewlett-Packard BASIC has an instruction REN I,K which renumbers the lines of a program with a new initial value I and a new interval K between line numbers. This makes it easy to insert new lines.

Unlike other keyboards the Hewlett-Packard keyboard has a key labeled PLIST which lists the program on the Inkjet printer.

The Macintosh computer has some neat features. Files are collected in folders. Each file has an icon, each folder has an icon, and the disk has an icon. On the screen there is an arrow whose position is moved by a mouse. If the arrow is centered over an icon and the mouse is clicked the icon is highlighted and the file is activated. An icon in one folder can be dragged to the disk icon, and then it can be dragged to another folder. The file is copied in the process. However, the icon disappears from the first folder if it is dragged directly to the second folder. If the icon of a folder is double clicked then the icons of files in the folder are displayed in a window.

A demonstration of the programs in a showcase is an invitation to any users to make use of the showcase in their own applications. A program can be transported on a disk between computers with the same model and the same system, but otherwise the program must be keyed in by hand. The program is transported as a listing which must be edited by the user.

The preparation of listings is by a set of LIST programs in the Quick BASIC system. Microsoft BASIC does not tolerate leading zeros unless they are enclosed in quotation marks, while True BASIC tolerates leading zeros but not strings of numerals. Microsoft BASIC inserts 00 after every ampersand unless the ampersand is enclosed between quotation marks, while True BASIC uses the ampersand to link strings. The preparation of listings is performed with quotation marks around any statement which is in jeopardy. After listing the quotation marks are covered with liquid paper, or the intact statement is cut out to make a patch.

For a computer to be of scientific value it must be able to compute. If it has only a calculator it is able only to calculate. Calculation is where the program is stored in the mind of the user. Computation is where the program is stored in the memory of the computer. Computation is possible with BASIC.

At the Naval Postgraduate School there are Macintosh Quadras and at Kinkos there are Power Macintoshes. Unfortunately these computers refuse to accept Microsoft BASIC. The probability that they can accept True BASIC has been the source of motivation for the present investigation.

The absence of interchangeability between machines and programs is pathetic.

INPUT

In FORTRAN a file is edited with the aid of the utility XEDIT. When editing is complete the file is returned to disk by the instruction FILE.

In BASIC a program must be keyed in by hand. The program is displayed in a window on the screen. If a symbol is inserted into a line, the rest of the line is shifted right. If a symbol is deleted from a line, the rest of the line is shifted left. If a whole line is inserted, every line below is shifted down. If a whole line is deleted, every line below is shifted up. The shifts are all automatic.

The automatic shifting is available for program files, but the program UPDATE is required for data files. Initially the user is asked for the name of the file to be edited. Then in the case of Hewlett-Packard BASIC or Microsoft BASIC the user is asked if a new file is to be created, in which case the new file is created, or in the case of True BASIC the icon of a /* must be dragged from the disk window to the True BASIC folder. This creates a kernel of the file. If the file already exists it is just copied from disk storage to transistor storage.

Next the user is asked for a line number, at which point the line with that number is displayed on the screen. The line can be edited, after which the user is asked to select an operation from the following list:

S=Save R=Replace I=Insert D=Delete F=File

When the editing is complete, the operation F copies the file from transistor storage back to disk storage.

When there is a repetition of the same set of lines, the program UPDATE may be modified so that the set of lines is inserted sequentially during the cycles of a loop.

When keying data into the computer it is wise to start with a hand written copy of the data. It is too easy to hit the wrong key and lose part of the input.

A line in a map can be simulated by a polygon if the sides of the polygon are short enough. It is necessary only to list the coordinates of corners of the polygon. Then a plotter can connect the corners to complete the polygon. Available data are USAMAP for the United States and WLDMAP for the World. There are 10000 data in USAMAP and there are 8000 data in WLDMAP. The data were digitized for the now obsolete Naval Ordnance Research Calculator.

On the main frame the data have the original NORC format. Each datum is a 16-digit word in the following format:

Digits	Interpretation
1	0 for N, 1 for S
2 - 4	degrees of latitude
5	0 for N, 1 for S
6 - 8	minutes of latitude
9	0 for E, 1 for W
10 - 12	degrees of longitude
13	0 for E, 1 for W
14 - 16	minutes of longitude

The first 11 digits in each record give the file number, the block number, and the record number. The block may have any size equal to or less than 100. The data in a block are preceded by a beginning-of-block word and are terminated with an end-of-block word. The beginning-of-block word and the end-of-block word give the number of words in each block. However, they are bypassed, because an end-of-line word is a row of sevens. A file is terminated with a NORC end-of-file word.

The plotting of maps on the main frame is controlled by subroutine CTGPHC. An auxiliary file gives the formats for any lines such as solid lines, dotted lines, dashed lines, or dot-dash lines. Reference is made to a mapping transformation for the conversion of geodetic coordinates into map coordinates.

For home computers each datum is expressed in bytes. Latitude is expressed as minutes north of the South Pole, and longitude is expressed as minutes east of the 180th Meridian. Each datum is a 4-byte word with the following format:

Bytes	Interpretation
1 - 2	Minutes of latitude
3 - 4	Minutes of longitude

where one high order unit is 256 low order units. Thus there has been a four-fold compression of the data.

The end-of-line word is 65535,0 and the end-of-section word is 65535,65535.There is provision for four sections of map with each section in one of four formats in DATA statements.

The program CTGPHK is set up to plot a map of the United States in the Mercator projection with solid lines for coasts, rivers, and lakes, with dashed lines for state boundaries, and with dot-dash lines for international boundaries. The region, the projection, the line formats, and the printer can be changed by editing within the program.

There are three versions of CTGPHK. One version is in Hewlett-Packard BASIC, the second version is in Microsoft BASIC, and the current version is in True BASIC.

TYPOGRAPHY

The characters in a character repertory can be simulated by polygons if the sides of the polygons are short enough. It is necessary only to list the coordinates of the corners of the polygons. Then a plotter can connect the corners to complete the polygons.

The printer's standard is 10-point type with 2 points of leading, where there are 72 points per inch. Polygonal simulation requires a finer raster.

The smallest circle is simulated by an octagon of radius 7 raster units because the square of 7 is 49 and nearly equal to 50 or twice the square of 5. Distinction between lower case and upper case requires a factor of 3 so the normal height of character is 21 raster units and the normal spacing between lines is 32 raster units. However, clarity is improved if 8 units are added to make the spacing 40 raster units. At the standard of 6 lines per inch there are 240 raster units per inch, which happens to be also the choice of IBM for their addressable raster.

On the main frame there is an occidental repertory OCCRPY with 1642 characters and there is an oriental repertory ORIRPY with 705 characters. The occidental repertory has Old English which is not everywhere obtainable. The repertories are scalable to any multiple of their normal size.

For the digitization the characters were plotted on 10-to-the-inch graph paper. Convenience in digitization was achieved when complements were recorded for negative coordinates. Thus negative values ranged from 50 to 99 while positive values ranged from 00 to 50. It was not necessary to devote a digit to the sign. The X-coordinate is positive rightward and the Y-coordinate is positive downward. Each datum is a 4-digit word with the following format:

Digits	Interpretation
1 - 2	X-coordinate
3 - 4	Y-coordinate

Each character occupies a block of data in NORC format. The first 11 digits in each record give the file number, the block number, and the record number. Each block begins at the beginning of a record and continues to the end of the block. The data in each block are preceded by a beginning-of-block word and are terminated by an end-of-block word. The beginning-of-block word and the end-of-block word give the number of words in each block. However, they are bypassed, because the end-of-line datum is 5000 and the end-of-character datum is 5050. The first datum for each character gives the distance to the left edge of the character block, and the second datum gives the distance to the right edge of the character block. The remainder of the data are the corners in the polygonal simulation with origin at the centroid of the character block.

The plotting of characters is under the control of subroutine TXGPHC. The repertory of characters is copied into an array AD while the address of each character is stored in an index array AI. Then reference to the index array locates any character at electronic speed.

Although any character can be located by its character number in the repertory, it is more convenient to identify the character by its alphanumeric symbol. Thus TXGPHC knows the numbers for characters in a large number of fonts.

Input to the textographic subroutine is a file of data in which each line of text is followed by any number of lines of control. The link between text data and control data is the column number in the line of text. The language of the control data is a set of mnemonics which abbreviate instructions to TXGPHC. A listing of the mnemonics for the main frame is enclosed herewith.

MNEMONICS FOR TYPOGRAPHY

PLOT	PLOT MODE
OC,XXXX,YYYY,	ORIGIN OF COORDINATES
MS,SSSS,SSSS,SSSS,SSSS,	MATRIX OF SCALING
XY,XXXX,YYYY,	RESETTING OF COORDINATES
OK,NNNN,	ORIENTATION OF CHARACTER
SK,NNNN,	SIZE OF CHARACTER
CK,NNNN,	CASE OF CHARACTER
WL,NNNN,	WIDTH OF LINE
PC,OMMM, OR PC,NNNN,	PLOTTING OF CHARACTER
PV,XXXX,YYYY,	PLOTTING OF VECTOR
.	RECYCLING WITHOUT CHANGE OF MODE
*	RECYCLING WITH CHANGE OF MODE

PRINT	PRINT MODE
OC,XXXX,YYYY,	ORIGIN OF COORDINATES
MS,SSSS,SSSS,SSSS,SSSS,	MATRIX OF SCALING
MA,XXXX,XXXX,YYYY,YYYY,	MARGIN ALLOWANCE
IS,XXXX,YYYY,	INTERVAL OF SPACING
XY,XXXX,YYYY,	RESETTING OF X AND Y
HY,XXXX,YYYY,	INCREMENTING OF X AND RESETTING OF Y
XV,XXXX,YYYY,	RESETTING OF X AND INCREMENTING OF Y
HV,XXXX,YYYY,	INCREMENTING OF X AND Y
WL,NNNN,	WIDTH OF LINE
CW,NNNN,	CHANGE OF WIDTH
XO	NO SPACE
XH	HALF SPACE
XN	EN SPACE
FX	FIXED SPACE
NX	INDEX
VP	PRIMARY VARIANT
VS	SECONDARY VARIANT
VT	TERTIARY VARIANT
VQ	QUATERNARY VARIANT
PN	PRINCIPAL LEVEL AT NORMAL SIZE
PI	PRINCIPAL LEVEL AT INDEXICAL SIZE
SB	SUBSCRIPT LEVEL AT INDEXICAL SIZE
SP	SUPERSCRIPT LEVEL AT INDEXICAL SIZE

NNNN,	CHARACTER NUMBER
LC	LOWER CASE
LR	LOWER CASE ROMAN
LG	LOWER CASE GREEK
LI	LOWER CASE ITALIC
UC	UPPER CASE
UR	UPPER CASE ROMAN
UG	UPPER CASE GREEK
UI	UPPER CASE ITALIC
KR	CARTOGRAPHIC ROMAN
KG	CARTOGRAPHIC GREEK
SR	SIMPLEX ROMAN
SG	SIMPLEX GREEK
SS	SIMPLEX SCRIPT
DR	DUPLEX ROMAN
CR	COMPLEX ROMAN
CG	COMPLEX GREEK
CI	COMPLEX ITALIC
CS	COMPLEX SCRIPT
CC	COMPLEX CYRILLIC
TR	TRIPLEX ROMAN
TI	TRIPLEX ITALIC
GG	GOTHIC GERMAN
GE	GOTHIC ENGLISH
GI	GOTHIC ITALIAN
NJ	NONJUSTIFICATION
AJ	AUTOJUSTIFICATION
(NN)	CONTINUATION
LL(NN,NN$YYYY)	LEADING OF LINE
QA(NN,NN/NN,NN) OR QA(NN,NN$XXXX)	QUADDING FOR ALIGNMENT
QL(NN,NN/NN,NN) OR QL(NN,NN$XXXX)	QUADDING TO LEFT
QR(NN,NN/NN,NN) OR QR(NN,NN$XXXX)	QUADDING TO RIGHT
QC(NN,NN/NN,NN) OR QC(NN,NN$XXXX)	QUADDING FOR CENTERING
RL(LL/NN,NN)	RULING OF LINE
RV(NN,NN)	RULING OF VECTOR
LD(NN,NN$NNNN)	LEADER
DV(NN,NN/NN,NN)	DIVISION
LM(NN,NN–NN,NN)	LIMITS
RD(NN,NN)	RADICAL
.	RECYCLING WITHOUT CHANGE OF MODE
*	RECYCLING WITH CHANGE OF MODE
FRAME	FRAME ADVANCE
RETURN	END OF OPERATION

For home computers each coordinate is expressed by a single byte with a bias of 64. Each datum is a two-byte word with the following format:

Byte	Interpretation
1	X-coordinate
2	Y-coordinate

This is a two-fold compression of the data. The end-of-line word is 0,64 and the end-of-character word is 0,0. From the biased data it is necessary only to subtract 64 to obtain the unbiased data.

The file OCINDX is the index for the occidental repertory in the file OCDATA, and the file ORINDX is the index for the oriental repertory in the file ORDATA.

Printing is under the control of the program TXGPHK. Input to the program consists of lines of ASCII, with each line of text followed by any number of lines of control. Mnemonics for the control data are listed hereafter.

For many characters in ASCII there are four variants in the printed output. The transliterations of ASCII into Greek are listed in the figure labeled GREEK, and the transliterations of ASCII into symbols are listed in the figure labeled SYMBOL. Application of the program to mathematics is illustrated by the figure labeled TEST. The program TXGPHK is set up to plot the Cross of Iona.

There are three versions of TXGPHK. One version is in Hewlett-Packard Basic, the second version is in Microsoft BASIC, and the current version is in true BASIC.

MNEMONICS

PLOT	PLOT MODE
OC,XXXX,YYYY,	ORIGIN OF COORDINATES
MS,SSSS,SSSS,SSSS,SSSS,	MATRIX OF SCALING
XY,XXXX,YYYY,	RESETTING OF COORDINATES
WL,NNNN,	WIDTH OF LINE
PC,NNNN,	PLOTTING OF CHARACTER
PV,XXXX,YYYY,	PLOTTING OF VECTOR
.	RECYCLING WITHOUT CHANGE OF MODE
*	RECYCLING WITH CHANGE OF MODE

PRINT	PRINT MODE
OC,XXXX,YYYY,	ORIGIN OF COORDINATES
MS,SSSS,SSSS,SSSS,SSSS,	MATRIX OF SCALING
MA,XXXX,XXXX,YYYY,YYYY,	MARGIN ALLOWANCE
IS,XXXX,YYYY,	INTERVAL OF SPACING
XY,XXXX,YYYY,	RESETTING OF X AND Y
HY,XXXX,YYYY,	INCREMENTING OF X AND RESETTING OF Y
XV,XXXX,YYYY,	RESETTING OF X AND INCREMENTING OF Y
HV,XXXX,YYYY,	INCREMENTING OF X AND Y
WL,NNNN,	WIDTH OF LINE
XO	NO SPACE
XH	HALF SPACE
XN	EN SPACE
NX	INDEX
VP	PRIMARY VARIANT
VS	SECONDARY VARIANT
VT	TERTIARY VARIANT
VQ	QUATERNARY VARIANT
PN	PRINCIPAL LEVEL AT NORMAL SIZE
PI	PRINCIPAL LEVEL AT INDEXICAL SIZE
SB	SUBSCRIPT LEVEL AT INDEXICAL SIZE
SP	SUPERSCRIPT LEVEL AT INDEXICAL SIZE

NNNN,	CHARACTER NUMBER
KR	CARTOGRAPHIC ROMAN
KG	CARTOGRAPHIC GREEK
SR	SIMPLEX ROMAN
SG	SIMPLEX GREEK
SS	SIMPLEX SCRIPT
DR	DUPLEX ROMAN
CR	COMPLEX ROMAN
CG	COMPLEX GREEK
CI	COMPLEX ITALIC
CS	COMPLEX SCRIPT
CC	COMPLEX CYRILLIC
TR	TRIPLEX ROMAN
TG	TRIPLEX GREEK
TI	TRIPLEX ITALIC
GG	GOTHIC GERMAN
GE	GOTHIC ENGLISH
GI	GOTHIC ITALIAN
NJ	NONJUSTIFICATION
AJ	AUTOJUSTIFICATION
(NN)	CONTINUATION
SX(NN)	SAVE X FOR ALIGNMENT
QX(NN)	SHIFT X FOR ALIGNMENT
LL(NN,NN$YYYY)	LEADING OF LINE
QL(NN,NN/NN,NN) OR QL(NN,NN$XXXX)	QUADDING TO LEFT
QC(NN,NN/NN,NN) OR QC(NN,NN$XXXX)	QUADDING FOR CENTERING
QR(NN,NN/NN,NN) OR QR(NN,NN$XXXX)	QUADDING TO RIGHT
RV(NN,NN)	RULING OF VECTOR
DV(NN,NN/NN,NN)	DIVISION
LM(NN,NN-NN,NN)	LIMITS
RD(NN,NN)	RADICAL
.	RECYCLING WITHOUT CHANGE OF MODE
*	RECYCLING WITH CHANGE OF MODE
FRAME	FRAME ADVANCE
RETURN	END OF OPERATION

PROGRAMS

In order to use the programs in the showcase the computer must be loaded with the standard edition of True BASIC and with the Communication Toolkit. Then the programs can be keyed in through the keyboard. The programs are listed in Appendix A.

SAMPLES

The best way to show how to use the computer would be a walk through the steps of a procedure. Otherwise, it should be helpful if a copy of input and a plot of output are available for comparison.

The Macintosh is connected to the Laserjet through the modem port. The Laserjet is set to LETTER format. The addressable raster has 1016 steps per inch in an 8"x10$\frac{1}{2}$" field. The resolvable raster has 300 dots per inch with resolution enhancement. The X-coordinate is positive rightward and the Y-coordinate is positive upward. The origin of coordinates is at the lower left corner of the printer field.

A few samples are presented in Appendix X.

DISCUSSION

A number of agencies have acquired the occidental repertory. The National Bureau of Standards has published a report in which the characters are listed and plotted in detail. The occidental repertory is the foundation of the Interactive Data Language of Research Systems, Inc. However, they use the conventional format for input where the text data and the control data are mixed together in a single stream. They use the exclamation point for the escape character. It is easier to proofread in the present system where each line of text data is seperate from the lines of control data.

On the main frame the subroutine TXGPHC provides both horizontal justification and vertical justification. All of the pages of a report can be prepared in a single pass.

On a home computer the program TXGPHK can prepare only single pages one at a time. Vertical justification must be performed by hand. It is possible that a program could be designed to report what to try for vertical justification.

In the usual application more than one plot are combined to make a composite plot. On the main frame the main program can call any number of subroutines and a composite plot is made in a single run. On the home computer only one plot is made in each run. The composite plot is assembled on a single sheet which is passed more than once through the printer.

Errors of registration are a problem.

CONCLUSION

Cartography and typography on a Laserjet printer are possible with True BASIC in a Macintosh computer.

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APPENDIX A

PROGRAMS

```
1 ! "UPDATE"
2 ! ***************************
3 ! True BASIC UPDATE (MAC)
4 ! ***************************
5 !
6 ! S=SAVE
7 ! R=REPLACE
8 ! I=INSERT
9 ! D=DELETE
10 ! F=FILE
11 !
12 ! /* = KERNEL FILE
13 ! /* = END OF FILE
14 !
15 OPTION NOLET
16 FOR I=1 TO 6400
17 C$[I:I]=" "
18 NEXT I
19 S$="++++*++++1++++*++++2++++*++++3++"
20 INPUT PROMPT "FILE NAME?":N$
21 OPEN#1: NAME N$, ORG BYTE
22 SET#1: RECSIZE 32
23 SET#1: POINTER BEGIN
24 N=1
25 READ#1,BYTES 32: B$
26 J=32*N
27 I=J-31
28 C$[I:J]=B$
29 N=N+1
30 K=ORD(B$[1:1])
31 K=256*K+ORD(B$[2:2])
32 IF K<>12074 THEN 25
33 INPUT PROMPT "INPUT N":N
34 J=32*N
35 I=J-31
36 A$=C$[I:J]
37 PRINT "A$="&A$
38 PRINT "   "&S$
39 LINE INPUT PROMPT "X$=":X$
40 PRINT "   "&S$
41 INPUT PROMPT "INPUT OP":K$
42 K=ORD(K$[1:1])
43 IF K=83 THEN 33
44 IF K=82 THEN 61
45 IF K=73 THEN 65
46 IF K=68 THEN 49
47 IF K=70 THEN 78
48 GOTO 41
49 K=N+1
50 J=32*K
```

```
51 I=J-31
52 A$=C$[I:J]
53 J=32*N
54 I=J-31
55 C$[I:J]=A$
56 N=K
57 K=ORD(A$[1:1])
58 K=256*K+ORD(A$[2:2])
59 IF K<>12074 THEN 49
60 GOTO 33
61 J=32*N
62 I=J-31
63 C$[I:J]=X$
64 GOTO 33
65 J=32*N
66 I=J-31
67 A$=C$[I:J]
68 C$[I:J]=X$
69 X$=A$
70 N=N+1
71 K=ORD(A$[1:1])
72 K=256*K+ORD(A$[2:2])
73 IF K<>12074 THEN 65
74 J=32*N
75 I=J-31
76 C$[I:J]=X$
77 GOTO 33
78 SET#1: POINTER BEGIN
79 N=1
80 J=32*N
81 I=J-31
82 A$=C$[I:J]
83 WRITE#1:A$
84 N=N+1
85 K=ORD(A$[1:1])
86 K=256*K+ORD(A$[2:2])
87 IF K<>12074 THEN 80
88 CLOSE#1
89 END
```

```
1 ! "CTGPHK"
2 ! ********************************
3 ! True BASIC CARTOGRAPHIC (MAC)
4 ! ********************************
5 OPTION NOLET
6 DIM F0(28)
7 OPEN#1: NAME "USAMAP", ORG BYTE
8 SET#1: RECSIZE 32
9 SET#1: POINTER BEGIN
10 DATA  777 , 777 , 042 , 028
11 DATA  000 , 000 , 028 , 028
12 DATA  000 , 000 , 028 , 028
13 DATA  000 , 000 , 028 , 000
14 DATA  000 , 000 , 042 , 000
15 DATA  000 , 000 , 000 , 000
16 DATA  000 , 000 , 000 , 000
17 FOR I7=1 TO 7
18 FOR J7=1 TO 4
19 K7=4*I7+J7-4
20 READ F0(K7)
21 NEXT J7
22 NEXT I7
23 RESTORE
24 LIBRARY "Comlib*"
25 CALL Com_open (#2,1,9600,"D8 P- S1 DTR RXOFF SXOFF")
26 CALL Send (CHR$(27)&"E")
27 CALL Send (CHR$(27)&"%0B")
28 CALL Send ("IN;"&"SP1;"&"PW.1;")
29 X0=5700
30 Y0=-5000
31 Q0=PI/10800
32 E0=65535
33 A0=48000/21600
34 C0=12000/PI
35 L0=1
36 N0=1
37 READ#1, BYTES 32: B$
38 I0=1
39 Y7=ORD(B$[I0:I0])
40 I0=I0+1
41 Y7=256*Y7+ORD(B$[I0:I0])
42 I0=I0+1
43 X7=ORD(B$[I0:I0])
44 I0=I0+1
45 X7=256*X7+ORD(B$[I0:I0])
46 I0=I0+1
47 IF Y7=65535 THEN 49
48 GOTO 51
49 IF X7=65535 THEN 97
50 GOTO 88
```

```
51 GOSUB 107
52 IF E0=65535 THEN 88
53 X4=X2-X1
54 Y4=Y2-Y1
55 S7=X4*X4+Y4*Y4
56 D7=SQR(S7)
57 K7=4*J7+N0-4
58 G7=F0(K7)
59 IF G7=0 THEN 84
60 IF H7+D7>=G7 THEN 66
61 S7=1
62 H7=H7+D7
63 D7=0
64 IF H7=0 THEN 91
65 GOTO 69
66 S7=(G7-H7)/D7
67 D7=H7+D7-G7
68 H7=0
69 X3=X1+S7*(X2-X1)
70 Y3=Y1+S7*(Y2-Y1)
71 IF J7=2*IP(J7/2) THEN 81
72 X5= 3600+Y1
73 Y5=10800-X1
74 A$="PU"&STR$(X5)&","&STR$(Y5)
75 CALL Send(A$)
76 X5= 3600+Y3
77 Y5=10800-X3
78 A$="PD"&STR$(X5)&","&STR$(Y5)
79 CALL Send(A$)
80 E7=E7
81 X1=X3
82 Y1=Y3
83 IF H7>0 THEN 91
84 J7=J7+1
85 IF J7<8 THEN 57
86 J7=1
87 GOTO 57
88 H7=0
89 D7=0
90 J7=1
91 E0=Y7
92 X1=X2
93 Y1=Y2
94 IF I0<33 THEN 39
95 L0=LO+1
96 GOTO 37
97 N0=N0+1
98 IF N0<=4 THEN 91
99 A$= CHR$(27)&"%0A"&CHR$(27)&"E"
```

```
100 FOR I=1 TO 256
101 A$=A$&" "
102 NEXT I
103 CALL Send (A$)
104 CLOSE#1
105 CLOSE#2
106 GOTO 114
107 !FND7
108 X2=X0+A0*(X7-5040)
109 Q7=Q0*(Y7-5400)
110 S7=SIN(Q7)
111 Y2=Y0-C0*LOG((1-S7)/(1+S7))
112 E7=Q7
113 RETURN
114 END
```

```
1 ! "CTGPHK"
2 ! ********************************
3 ! True BASIC CARTOGRAPHIC (MAC)
4 ! ********************************
5 OPTION NOLET
6 DIM F0(28)
7 OPEN#1: NAME "WLDMAP", ORG BYTE
8 SET#1: RECSIZE 32
9 SET#1: POINTER BEGIN
10 DATA  777 , 777 , 042 , 028
11 DATA  000 , 000 , 028 , 028
12 DATA  000 , 000 , 028 , 028
13 DATA  000 , 000 , 028 , 000
14 DATA  000 , 000 , 042 , 000
15 DATA  000 , 000 , 000 , 000
16 DATA  000 , 000 , 000 , 000
17 FOR I7=1 TO 7
18 FOR J7=1 TO 4
19 K7=4*I7+J7-4
20 READ F0(K7)
21 NEXT J7
22 NEXT I7
23 RESTORE
24 LIBRARY "Comlib*"
25 CALL Com_open (#2,1,9600,"D8 P- S1 DTR RXOFF SXOFF")
26 CALL Send (CHR$(27)&"E")
27 CALL Send (CHR$(27)&"%0B")
28 CALL Send ("IN;"&"SP1;"&"PW.1;")
29 X0=2500
30 Y0=0
31 Q0=PI/10800
32 E0=65535
33 A0=6400/21600
34 C0=1600/PI
35 L0=1
36 N0=1
37 READ#1, BYTES 32: B$
38 I0=1
39 Y7=ORD(B$[I0:I0])
40 I0=I0+1
41 Y7=256*Y7+ORD(B$[I0:I0])
42 I0=I0+1
43 X7=ORD(B$[I0:I0])
44 I0=I0+1
45 X7=256*X7+ORD(B$[I0:I0])
46 I0=I0+1
47 IF Y7=65535 THEN 49
48 GOTO 51
49 IF X7=65535 THEN 97
50 GOTO 88                                              WLDMAP'
```

```
51 GOSUB 107
52 IF E0=65535 THEN 88
53 X4=X2-X1
54 Y4=Y2-Y1
55 S7=X4*X4+Y4*Y4
56 D7=SQR(S7)
57 K7=4*J7+N0-4
58 G7=F0(K7)
59 IF G7=0 THEN 84
60 IF H7+D7>=G7 THEN 66
61 S7=1
62 H7=H7+D7
63 D7=0
64 IF H7=0 THEN 91
65 GOTO 69
66 S7=(G7-H7)/D7
67 D7=H7+D7-G7
68 H7=0
69 X3=X1+S7*(X2-X1)
70 Y3=Y1+S7*(Y2-Y1)
71 IF J7=2*IP(J7/2) THEN 81
72 X5= 4000+Y1
73 Y5=10800-X1
74 A$="PU"&STR$(X5)&","&STR$(Y5)
75 CALL Send (A$)
76 X5= 4000+Y3
77 Y5=10800-X3
78 A$="PD"&STR$(X5)&","&STR$(Y5)
79 CALL Send (A$)
80 E7=E7
81 X1=X3
82 Y1=Y3
83 IF H7>0 THEN 91
84 J7=J7+1
85 IF J7<8 THEN 57
86 J7=1
87 GOTO 57
88 H7=0
89 D7=0
90 J7=1
91 E0=Y7
92 X1=X2
93 Y1=Y2
94 IF I0<33 THEN 39
95 L0=LO+1
96 GOTO 37
97 N0=N0+1
98 IF N0<=1 THEN 91
99 A$= CHR$(27)&"%0A"&CHR$(27)&"E"
```

WLDMAP'

```
100 FOR I=1 TO 256
101 A$=A$&" "
102 NEXT I
103 CALL Send (A$)
104 CLOSE#1
105 CLOSE#2
106 GOTO 114
107 !FND7
108 X2=X0+A0*X7
109 Q7=Q0*(Y7-5400)
110 S7=SIN(Q7)
111 Y2=Y0-C0*LOG((1-S7)/(1+S7))
112 E7=Q7
113 RETURN
114 END
```

```
1 ! "TXGPHK"
2 ! ********************************
3 ! True BASIC TEXTOGRAPHIC (MAC)
4 ! ********************************
5 !
6 ! E=1 FOR FRAME
7 ! E=2 FOR RETURN
8 ! E=3 FOR ERROR
9 !
10 OPTION NOLET
11 DECLARE FUNCTION FNI7,FND7,FNT7
12 DIM K0(32),K1(32),D1(96),D2(288)
13 DIM G1(28),G2(28),G3(28),G4(28)
14 DIM F1(32),F2(32),F3(32),F4(32)
15 OPEN#1: NAME "OCINDX", ORG BYTE
16 SET#1: RECSIZE 32
17 OPEN#2: NAME "OCDATA", ORG BYTE
18 SET#2: RECSIZE 32
19 OPEN#3: NAME "KROSS", ORG BYTE
20 SET#3: RECSIZE 32
21 SET#3: RECORD 1
22 DATA  027 , 028 , 048 , 030
23 DATA  031 , 047 , 029 , 033
24 DATA  035 , 000 , 036 , 037
25 DATA  038 , 039 , 041 , 042
26 DATA  034 , 043 , 044 , 045
27 DATA  046 , 000 , 050 , 040
28 DATA  049 , 032 , 000 , 000
29 FOR I7=1 TO 28
30 READ X7
31 G1(I7)=X7
32 NEXT I7
33 DATA  127 , 128 , 148 , 130
34 DATA  131 , 147 , 129 , 133
35 DATA  135 , 000 , 136 , 137
36 DATA  138 , 139 , 141 , 142
37 DATA  134 , 143 , 144 , 145
38 DATA  146 , 000 , 150 , 140
39 DATA  149 , 132 , 000 , 000
40 FOR I7=1 TO 28
41 READ X7
42 G2(I7)=X7
43 NEXT I7
44 DATA  027 , 028 , 048 , 266
45 DATA  031 , 047 , 029 , 033
46 DATA  035 , 000 , 036 , 037
47 DATA  038 , 039 , 041 , 401
48 DATA  034 , 043 , 402 , 045
49 DATA  046 , 000 , 050 , 040
50 DATA  049 , 032 , 000 , 000
```

```
51 FOR I7=1 TO 28
52 READ X7
53 G3(I7)=X7
54 NEXT I7
55 DATA  127 , 128 , 148 , 265
56 DATA  184 , 186 , 129 , 133
57 DATA  135 , 000 , 136 , 137
58 DATA  138 , 139 , 141 , 142
59 DATA  185 , 143 , 144 , 145
60 DATA  146 , 000 , 150 , 140
61 DATA  149 , 132 , 000 , 000
62 FOR I7=1 TO 28
63 READ X7
64 G4(I7)=X7
65 NEXT I7
66 DATA  214 , 214 , 214 , 214
67 DATA  217 , 217 , 217 , 217
68 DATA  275 , 275 , 267 , 411
69 DATA  274 , 274 , 268 , 412
70 DATA  271 , 271 , 271 , 271
71 DATA  272 , 272 , 272 , 272
72 DATA  216 , 216 , 216 , 252
73 DATA  221 , 221 , 221 , 403
74 DATA  222 , 222 , 222 , 404
75 DATA  219 , 219 , 235 , 236
76 DATA  232 , 232 , 232 , 233
77 DATA  211 , 211 , 211 , 251
78 DATA  231 , 231 , 231 , 234
79 DATA  210 , 210 , 210 , 210
80 DATA  220 , 220 , 220 , 239
81 DATA  212 , 212 , 212 , 212
82 DATA  213 , 213 , 213 , 213
83 DATA  241 , 241 , 243 , 227
84 DATA  238 , 238 , 238 , 240
85 DATA  242 , 242 , 244 , 228
86 DATA  215 , 215 , 215 , 215
87 DATA  273 , 273 , 218 , 270
88 DATA  223 , 223 , 223 , 405
89 DATA  084 , 084 , 276 , 277
90 DATA  224 , 224 , 224 , 406
91 DATA  085 , 085 , 259 , 257
92 DATA  261 , 262 , 263 , 264
93 DATA  225 , 225 , 225 , 407
94 DATA  229 , 229 , 229 , 230
95 DATA  226 , 226 , 226 , 408
96 DATA  000 , 000 , 000 , 000
97 DATA  000 , 000 , 000 , 000
98 FOR I7=1 TO 32
99 READ P7,S7,T7,Q7
100 F1(I7)=P7
```

TXGPHK

```
101 F2(I7)=S7
102 F3(I7)=T7
103 F4(I7)=Q7
104 NEXT I7
105 RESTORE
106 LIBRARY "Comlib*"
107 CALL Com_open (#4,1,9600,"D8 P- S1 DTR RXOFF SXOFF")
108 CALL Send (CHR$(27)&"E"&CHR$(27)&"%0B"&"IN;"&"SP1;")
109 I0=1
110 J0=0
111 L0=0
112 K7=32
113 GOSUB 731
114 P7=K0(K7)
115 GOSUB 731
116 P7=256*P7+K0(K7)
117 IF P7=20556 THEN 122
118 IF P7=20562 THEN 151
119 IF P7=18002 THEN 889
120 IF P7=21061 THEN 891
121 GOTO 893
122 K7=32
123 GOSUB 731
124 IF K0(K7)=44 THEN 123
125 IF K0(K7)=46 THEN 122
126 IF K0(K7)=42 THEN 112
127 P7=K0(K7)
128 GOSUB 731
129 P7=256*P7+K0(K7)
130 GOSUB 731
131 Q0=.001
132 IF P7=20566 THEN 139
133 IF P7=20547 THEN 141
134 IF P7=22617 THEN 143
135 IF P7=22348 THEN 145
136 IF P7=19795 THEN 147
137 IF P7=20291 THEN 149
138 GOTO 893
139 GOSUB 721
140 GOTO 124
141 GOSUB 698
142 GOTO 124
143 GOSUB 635
144 GOTO 124
145 GOSUB 630
146 GOTO 124
147 GOSUB 597
148 GOTO 124
149 GOSUB 588
150 GOTO 124
```

TXGPHK

```
151 K7=32
152 GOSUB 731
153 FOR K7=1 TO 32
154 K1(K7)=K0(K7)
155 NEXT K7
156 N7=1
157 GOSUB 731
158 P7=K0(K7)
159 IF P7=44 THEN 157
160 IF P7=41 THEN 157
161 Q0=.001
162 IF P7>64 THEN 168
163 IF P7>47 THEN 521
164 IF P7=40 THEN 525
165 IF P7=46 THEN 773
166 IF P7=42 THEN 773
167 GOTO 893
168 GOSUB 731
169 Q7=K0(K7)
170 GOSUB 731
171 P7=P7-64
172 IF P7>13 THEN 174
173 ON P7 GOTO 176,187,188,205,251,252,253,263,269,272,273,283,354
174 P7=P7-13
175 ON P7 GOTO 360,369,372,385,409,443,478,488,489,501,504,519,520
176 IF Q7<>74 THEN 893
177 J0=1
178 J1=1
179 N3=0
180 L1=M1
181 L3=M1
182 L4=0
183 Q1=0
184 X1=M1
185 V2=0
186 GOTO 158
187 GOTO 893
188 IF Q7<>82 THEN 191
189 G0=0
190 GOTO 158
191 IF Q7<>71 THEN 194
192 G0=26
193 GOTO 158
194 IF Q7<>73 THEN 197
195 G0=50
196 GOTO 158
197 IF Q7<>83 THEN 201
198 F0=2500
199 G0=50
200 GOTO 158
```

```
201 IF Q7<>67 THEN 893
202 F0=2800
203 G0=0
204 GOTO 158
205 IF Q7<>82 THEN 209
206 F0=2500
207 G0=0
208 GOTO 158
209 IF Q7<>86 THEN 893
210 GOSUB 663
211 K2=.5*(K4+K5)
212 C7=D1(3*K2-2)
213 F7=IP(C7/1000)
214 IF I4-I3>I6-I5 THEN 233
215 X2=I3-I5+2*F7
216 Y2=12*F7
217 L7=K5
218 M7=K6
219 GOSUB 693
220 X2=X2+2*F7
221 Y2=0
222 L7=K6+1
223 M7=32
224 GOSUB 693
225 X2=X2-.5*(I3+I4-I5-I6)-2*F7
226 Y2=-12*F7
227 L7=K3
228 M7=K4
229 GOSUB 693
230 D1(3*K2-2)=20000-I5+I6
231 D1(3*K2-1)=X2+.5*(I3+I4)
232 GOTO 158
233 X2=2*F7
234 Y2=-12*F7
235 L7=K3
236 M7=K4
237 GOSUB 693
238 X2=X2+I4-I6+2*F7
239 Y2=0
240 L7=K6+1
241 M7=32
242 GOSUB 693
243 X2=X2+.5*(I3-I4-I5+I6)-2*F7
244 Y2=12*F7
245 L7=K5
246 M7=K6
247 GOSUB 693
248 D1(3*K2-2)=20000-I3+I4
249 D1(3*K2-1)=X2+.5*(I5+I6)
250 GOTO 158
```

```
251 GOTO 893
252 GOTO 893
253 G0=0
254 IF Q7<>71 THEN 257
255 F0=3300
256 GOTO 158
257 IF Q7<>69 THEN 260
258 F0=3500
259 GOTO 158
260 IF Q7<>73 THEN 893
261 F0=3800
262 GOTO 158
263 IF Q7<>89 THEN 266
264 GOSUB 649
265 GOTO 158
266 IF Q7<>86 THEN 893
267 GOSUB 656
268 GOTO 158
269 IF Q7<>83 THEN 893
270 GOSUB 610
271 GOTO 158
272 GOTO 893
273 F0=0
274 IF Q7<>82 THEN 277
275 G0=0
276 GOTO 158
277 IF Q7<>71 THEN 280
278 G0=26
279 GOTO 158
280 IF Q7<>73 THEN 893
281 G0=50
282 GOTO 158
283 IF Q7<>76 THEN 291
284 X2=0
285 GOSUB 663
286 Y2=C7
287 L7=K3
288 M7=K4
289 GOSUB 693
290 GOTO 158
291 IF Q7<>77 THEN 893
292 GOSUB 663
293 C7=D1(3*K3-5)
294 E7=FNI7(C7)
295 I1=I1+D1(3*K3-4)
296 I2=I2+D1(3*K3-4)
297 F7=IP(C7/1000)
298 C7=C7-1000*F7
299 IF C7=412 THEN 301
300 IF C7<>268 THEN 311
```

```
301 X2=-4*F7
302 GOSUB 339
303 IF I4-I3+X2>=I6-I5 THEN 306
304 X2=I3-I5
305 GOTO 307
306 X2=I4-I6-4*F7
307 GOSUB 344
308 X2=I3-I5
309 GOSUB 349
310 GOTO 158
311 IF I4-I3>=I6-I5 THEN 322
312 IF I2-I1>I6-I5 THEN 332
313 X2=I1-I3+.5*(I3-I4-I5+I6)
314 GOSUB 339
315 X2=X2+.5*(I3+I4-I5-I6)
316 GOSUB 344
317 X2=X2
318 GOSUB 349
319 X2=X2+.5*(I5+I6)
320 D1(3*K3-4)=X2
321 GOTO 158
322 IF I2-I1>I4-I3 THEN 332
323 X2=I1-I3
324 GOSUB 339
325 X2=X2+I4-I6
326 GOSUB 344
327 X2=X2+.5*(I3-I4-I5+I6)
328 GOSUB 349
329 X2=X2+.5*(I5+I6)
330 D1(3*K3-4)=X2
331 GOTO 158
332 X2=.5*(I1+I2-I3-I4)
333 GOSUB 339
334 X2=I2-I6
335 GOSUB 344
336 X2=.5*(I1+I2-I5-I6)
337 GOSUB 349
338 GOTO 158
339 Y2=18*F7
340 L7=K3
341 M7=K4
342 GOSUB 693
343 RETURN
344 Y2=0
345 L7=K6+1
346 M7=32
347 GOSUB 693
348 RETURN
349 Y2=-18*F7
350 L7=K5
```

```
351 M7=K6
352 GOSUB 693
353 RETURN
354 IF Q7<>83 THEN 357
355 GOSUB 597
356 GOTO 158
357 IF Q7<>65 THEN 893
358 GOSUB 617
359 GOTO 158
360 IF Q7<>74 THEN 363
361 J1=0
362 GOTO 158
363 IF Q7<>88 THEN 893
364 D1(3*N7-2)=2197
365 D1(3*N7-1)=X1
366 D1(3*N7)=Y1
367 N7=N7+1
368 GOTO 158
369 IF Q7<>67 THEN 893
370 GOSUB 588
371 GOTO 158
372 IF Q7<>73 THEN 375
373 F0=1000
374 GOTO 377
375 IF Q7<>78 THEN 893
376 F0=2000
377 IF L0<>-1 THEN 380
378 X1=X1
379 Y1=Y1+10
380 IF L0<>1 THEN 383
381 X1=X1+2
382 Y1=Y1-10
383 L0=0
384 GOTO 158
385 Y2=0
386 IF Q7<>76 THEN 390
387 GOSUB 663
388 X2=I6-I3
389 GOTO 405
390 IF Q7<>67 THEN 394
391 GOSUB 663
392 X2=-.5*(I3+I4-I5-I6)
393 GOTO 405
394 IF Q7<>82 THEN 398
395 GOSUB 663
396 X2=I5-I4
397 GOTO 405
398 IF Q7<>88 THEN 893
399 GOSUB 731
400 GOSUB 741
```

```
401 X2=H0-D1(3*C7-1)
402 Y2=0
403 K3=1
404 K4=32
405 L7=K3
406 M7=K4
407 GOSUB 693
408 GOTO 158
409 IF Q7<>86 THEN 420
410 GOSUB 731
411 GOSUB 741
412 X3=D1(3*C7-1)
413 Y3=D1(3*C7)
414 GOSUB 731
415 GOSUB 741
416 X4=D1(3*C7-1)
417 Y4=D1(3*C7)
418 GOSUB 762
419 GOTO 158
420 IF Q7<>68 THEN 893
421 GOSUB 676
422 C7=D1(3*K5-8)
423 F7=IP(C7/1000)
424 C7=C7-1000*F7
425 IF C7<>411 THEN 430
426 I3=4*F7
427 I4=-24*F7
428 I7=2*F7
429 GOTO 434
430 IF C7<>267 THEN 893
431 I3=8*F7
432 I4=-12*F7
433 I7=0
434 X2=D1(3*K5-7)+I3-I5+I7
435 Y2=0
436 L7=K5
437 M7=32
438 GOSUB 693
439 D1(3*K5-5)=20000-I5+I6+I7
440 D1(3*K5-4)=X2+.5*(I5+I6-I7)
441 D1(3*K5-3)=D1(3*K5-3)+I4
442 GOTO 158
443 IF Q7<>66 THEN 453
444 IF L0<>-1 THEN 447
445 X1=X1
446 Y1=Y1+20
447 IF L0<>0 THEN 450
448 X1=X1
449 Y1=Y1+10
450 L0=1
```

```
451 F0=1000
452 GOTO 158
453 IF Q7<>80 THEN 463
454 IF L0<>1 THEN 457
455 X1=X1
456 Y1=Y1-20
457 IF L0<>0 THEN 460
458 X1=X1+2
459 Y1=Y1-10
460 L0=-1
461 F0=1000
462 GOTO 158
463 F0=500
464 IF Q7<>82 THEN 467
465 G0=0
466 GOTO 158
467 IF Q7<>71 THEN 470
468 G0=26
469 GOTO 158
470 IF Q7<>83 THEN 473
471 G0=50
472 GOTO 158
473 IF Q7<>88 THEN 893
474 GOSUB 731
475 GOSUB 741
476 H0=D1(3*C7-1)
477 GOTO 158
478 F0=3000
479 IF Q7<>82 THEN 482
480 G0=0
481 GOTO 158
482 IF Q7<>71 THEN 485
483 G0=26
484 GOTO 158
485 IF Q7<>73 THEN 893
486 G0=50
487 GOTO 158
488 GOTO 893
489 IF Q7<>80 THEN 492
490 V0=1
491 GOTO 158
492 IF Q7<>83 THEN 495
493 V0=2
494 GOTO 158
495 IF Q7<>84 THEN 498
496 V0=3
497 GOTO 158
498 IF Q7<>81 THEN 893
499 V0=4
500 GOTO 158
```

```
501 IF Q7<>76 THEN 893
502 GOSUB 630
503 GOTO 158
504 IF Q7<>89 THEN 507
505 GOSUB 635
506 GOTO 158
507 IF Q7<>86 THEN 510
508 GOSUB 642
509 GOTO 158
510 IF Q7<>79 THEN 513
511 S0=0
512 GOTO 158
513 IF Q7<>72 THEN 516
514 S0=1
515 GOTO 158
516 IF Q7<>78 THEN 893
517 S0=2
518 GOTO 158
519 GOTO 893
520 GOTO 893
521 GOSUB 741
522 I7=C7
523 GOSUB 580
524 GOTO 158
525 GOSUB 731
526 GOSUB 741
527 M7=C7
528 I7=K1(N7)-32
529 IF I7<16 THEN 542
530 I7=I7+184
531 IF I7<210 THEN 576
532 I7=I7-194
533 IF I7<23 THEN 542
534 I7=I7-22
535 IF I7<27 THEN 559
536 I7=I7-4
537 IF I7<28 THEN 542
538 I7=I7+72
539 IF I7<127 THEN 567
540 I7=I7-99
541 IF I7>30 THEN 893
542 IF I7<>0 THEN 550
543 IF F0>10000 THEN 893
544 C7=10000+8*S0
545 IF F0<>1000 THEN 547
546 C7=10000+6*S0
547 IF F0<>0 THEN 577
548 C7=10000+4*S0
549 GOTO 577
550 IF V0<>1 THEN 552
```

```
551 C7=F0+F1(I7)
552 IF V0<>2 THEN 554
553 C7=F0+F2(I7)
554 IF V0<>3 THEN 556
555 C7=F0+F3(I7)
556 IF V0<>4 THEN 577
557 C7=F0+F4(I7)
558 GOTO 577
559 IF G0=26 THEN 562
560 C7=F0+G0+I7
561 GOTO 577
562 IF V0>2 THEN 565
563 C7=F0+G1(I7)
564 GOTO 577
565 C7=F0+G3(I7)
566 GOTO 577
567 IF G0=26 THEN 570
568 C7=F0+G0+I7
569 GOTO 577
570 I7=I7-100
571 IF V0>2 THEN 574
572 C7=F0+G2(I7)
573 GOTO 577
574 C7=F0+G4(I7)
575 GOTO 577
576 C7=F0+I7
577 GOSUB 580
578 IF N7<=M7 THEN 528
579 GOTO 158
580 D1(3*N7-2)=C7
581 E7=FNI7(C7)
582 X1=X1-I1
583 D1(3*N7-1)=X1
584 D1(3*N7)=Y1
585 X1=X1+I2+H1
586 N7=N7+1
587 RETURN
588 GOSUB 731
589 GOSUB 741
590 X7=C7
591 GOSUB 731
592 GOSUB 741
593 Y7=C7
594 X0=S1*X7+S2*Y7
595 Y0=S3*X7+S4*Y7
596 RETURN
597 GOSUB 731
598 GOSUB 741
599 S1=C7
600 GOSUB 731
```

```
601 GOSUB 741
602 S2=C7
603 GOSUB 731
604 GOSUB 741
605 S3=C7
606 GOSUB 731
607 GOSUB 741
608 S4=C7
609 RETURN
610 GOSUB 731
611 GOSUB 741
612 H1=C7
613 GOSUB 731
614 GOSUB 741
615 V1=C7
616 RETURN
617 GOSUB 731
618 GOSUB 741
619 M1=C7
620 GOSUB 731
621 GOSUB 741
622 M2=C7
623 GOSUB 731
624 GOSUB 741
625 M3=C7
626 GOSUB 731
627 GOSUB 741
628 M4=C7
629 RETURN
630 GOSUB 731
631 GOSUB 741
632 W0=C7
633 CALL Send ("PW"&STR$(W0))
634 RETURN
635 GOSUB 731
636 GOSUB 741
637 X1=C7
638 GOSUB 731
639 GOSUB 741
640 Y1=C7
641 RETURN
642 GOSUB 731
643 GOSUB 741
644 X1=C7
645 GOSUB 731
646 GOSUB 741
647 Y1=Y1+C7
648 RETURN
649 GOSUB 731
650 GOSUB 741
```

```
651 X1=X1+C7
652 GOSUB 731
653 GOSUB 741
654 Y1=C7
655 RETURN
656 GOSUB 731
657 GOSUB 741
658 X1=X1+C7
659 GOSUB 731
660 GOSUB 741
661 Y1=Y1+C7
662 RETURN
663 GOSUB 676
664 I3=I5
665 I4=I6
666 K3=K5
667 K4=K6
668 IF K0(K7)<>36 THEN 674
669 GOSUB 731
670 GOSUB 741
671 I5=C7
672 I6=I5
673 GOTO 675
674 GOSUB 676
675 RETURN
676 GOSUB 731
677 GOSUB 741
678 K5=C7
679 IF K0(K7)=44 THEN 682
680 K6=K5
681 GOTO 685
682 GOSUB 731
683 GOSUB 741
684 K6=C7
685 C7=D1(3*K5-2)
686 E7=FNI7(C7)
687 I5=I1+D1(3*K5-1)
688 IF K5=K6 THEN 691
689 C7=D1(3*K6-2)
690 E7=FNI7(C7)
691 I6=I2+D1(3*K6-1)
692 RETURN
693 FOR N7=L7 TO M7
694 D1(3*N7-1)=D1(3*N7-1)+X2
695 D1(3*N7)=D1(3*N7)+Y2
696 NEXT N7
697 RETURN
698 GOSUB 731
699 GOSUB 741
700 X2=X1
```

```
701 Y2=Y1
702 IF C7=0 THEN 720
703 IF C7>=10000 THEN 720
704 I7=FNI7(C7)
705 E7=1
706 GOTO 710
707 E7=0
708 X3=X4
709 Y3=Y4
710 D7=FND7(C7)
711 IF X4=-64 THEN 717
712 X4=X2+X4
713 Y4=Y2+Y4
714 IF E7<>0 THEN 707
715 GOSUB 762
716 GOTO 707
717 IF Y4=-64 THEN 720
718 E7=1
719 GOTO 710
720 RETURN
721 GOSUB 731
722 GOSUB 741
723 X3=X1
724 X4=C7
725 GOSUB 731
726 GOSUB 741
727 Y3=Y1
728 Y4=C7
729 GOSUB 762
730 RETURN
731 IF K7>=32 THEN 735 ELSE 733
732 IF K0(K7)<>32 THEN 740
733 K7=K7+1
734 IF K7<=32 THEN 732
735 E7=FNT7(I0)
736 IF E7<>0 THEN 893
737 I0=I0+1
738 K7=1
739 GOTO 732
740 RETURN
741 C7=1
742 R7=0
743 S7=-1
744 IF K0(K7)=45 THEN 754
745 S7=+1
746 IF K0(K7)=43 THEN 754
747 IF K0(K7)=32 THEN 754
748 IF K0(K7)<48 THEN 760
749 IF K0(K7)<>81 THEN 752
750 C7=Q0*C7
```

```
751 GOTO 754
752 R7=10*R7+K0(K7)-48
753 C7=R7
754 K7=K7+1
755 IF K7<=32 THEN 747
756 E7=FNT7(I0)
757 I0=I0+1
758 K7=1
759 GOTO 747
760 C7=S7*C7
761 RETURN
762 X5=X0+S1*X3+S2*Y3
763 Y5=Y0+S3*X3+S4*Y3
764 X6=X0+S1*X4+S2*Y4
765 Y6=Y0+S3*X4+S4*Y4
766 X7= 4000+Y5
767 Y7=10800-X5
768 CALL Send ("PU"&STR$(X7)&","&STR$(Y7))
769 X7= 4000+Y6
770 Y7=10800-X6
771 CALL Send ("PD"&STR$(X7)&","&STR$(Y7))
772 RETURN
773 IF J0<>0 THEN 787
774 FOR K7=1 TO 32
775 D2(3*K7-2)=D1(3*K7-2)
776 D2(3*K7-1)=D1(3*K7-1)
777 D2(3*K7)=D1(3*K7)
778 NEXT K7
779 M7=32
780 V2=0
781 GOSUB 867
782 X1=M1
783 Y1=Y1+V2
784 V2=0
785 IF P7=46 THEN 151
786 IF P7=42 THEN 112
787 N1=0
788 C7=D1(3*N1+1)
789 E7=FNI7(C7)
790 H2=L3-D1(3*N1+2)-I1
791 L7=N1+1
792 FOR K7=L7 TO 32
793 C7=D1(3*K7-2)
794 IF C7>=20000 THEN 807
795 IF C7<10000 THEN 807
796 NEXT K7
797 IF J1<>0 THEN 803
798 IF N3=0 THEN 801
799 M7=N3
800 GOSUB 867
```

```
801 Y1=Y1+V2
802 V2=0
803 X1=M1
804 J0=J1
805 IF P7=46 THEN 151
806 IF P7=42 THEN 112
807 E7=FNI7(C7)
808 N1=K7-1
809 L1=D1(3*K7-1)+I1+H2
810 L7=K7
811 FOR K7=L7 TO 32
812 C7=D1(3*K7-2)
813 IF C7>=20000 THEN 816
814 IF C7<10000 THEN 816
815 GOTO 819
816 NEXT K7
817 Q2=0
818 GOTO 820
819 Q2=C7-10000
820 N2=K7
821 C7=D1(3*K7-5)
822 E7=FNI7(C7)
823 L2=D1(3*K7-4)+I2+H2
824 IF L2<M2 THEN 832
825 L7=L2-M2
826 IF L7>M2-L1+Q1 THEN 828
827 IF L7<.5*L4 THEN 832
828 Q2=Q1
829 N2=N1
830 L2=L1-Q1
831 GOTO 851
832 L7=N1+1
833 M7=N2
834 N7=N3
835 FOR K7=L7 TO M7
836 C7=D1(3*K7-2)
837 X7=D1(3*K7-1)
838 Y7=D1(3*K7)
839 N7=N7+1
840 D2(3*N7-2)=C7
841 D2(3*N7-1)=X7+H2
842 D2(3*N7)=Y7
843 NEXT K7
844 Q1=Q2
845 N1=N2
846 L1=L2+Q2
847 N3=N7
848 L3=L1
849 L4=L4+Q2
850 IF L2<M2 THEN 791
```

```
851 H3=0
852 H4=M2-L2
853 L3=0
854 L4=L4-Q2
855 M7=N3
856 FOR N7=1 TO M7
857 C7=D2(3*N7-2)
858 IF C7>=20000 THEN 862
859 IF C7<10000 THEN 862
860 L3=L3+C7-10000
861 H3=IP(L3/L4*H4)
862 D2(3*N7-1)=D2(3*N7-1)+H3
863 NEXT N7
864 GOSUB 867
865 L4=0
866 IF N1>=32 THEN 797 ELSE 788
867 Y7=16+.5*V1
868 IF Y1+V2+Y7<=M4 THEN 871
869 V2=M3-Y1+Y7
870 GOTO 891
871 FOR N7=1 TO M7
872 C7=D2(3*N7-2)
873 X2=D2(3*N7-1)
874 Y2=D2(3*N7)+V2
875 IF C7<20000 THEN 883
876 C7=C7-20000
877 X3=X2-IP(C7/2)
878 X4=X3+C7
879 Y3=Y2
880 Y4=Y2
881 GOSUB 762
882 GOTO 884
883 GOSUB 702
884 NEXT N7
885 N3=0
886 L3=M1
887 V2=V2+32+V1
888 RETURN
889 E=1
890 GOTO 896
891 E=2
892 GOTO 896
893 E=3
894 GOTO 896
895 !GCLEAR
896 PRINT "E=";E
897 GOTO 956
898 DEF FNI7(N0)
899 !FNI7
900 IF N0<10000 THEN 906
```

```
901 A7=0
902 N0=N0-1000*IP(N0/1000)
903 I1=-IP(N0/2)
904 I2=I1+N0
905 GOTO 924
906 L7=0
907 I7=IP((N0-1)/16)+1
908 SET#1: RECORD 32*I7-31
909 READ#1: A$
910 I7=2*N0-32*I7+31
911 A7=4*ORD(A$[I7:I7])
912 J7=I7+1
913 B7=4*ORD(A$[J7:J7])
914 I7=8*A7+IP(B7/32)+1
915 J7=B7-32*IP(B7/32)+1
916 IF L7=I7 THEN 920
917 L7=I7
918 SET#2: RECORD 32*L7-31
919 READ#2: B$
920 I1=ORD(B$[J7:J7])-64
921 J7=J7+1
922 I2=ORD(B$[J7:J7])-64
923 B7=B7+2
924 I7=A7
925 FNI7=A7
926 END DEF
927 DEF FND7(N0)
928 !FND7
929 I7=8*A7+IP(B7/32)+1
930 J7=B7-32*IP(B7/32)+1
931 IF L7=I7 THEN 935
932 L7=I7
933 SET#2: RECORD 32*L7-31
934 READ#2: B$
935 X4=ORD(B$[J7:J7])-64
936 J7=J7+1
937 Y4=ORD(B$[J7:J7])-64
938 B7=B7+2
939 J7=B7
940 FND7=B7
941 END DEF
942 DEF FNT7(I0)
943 SET#3: RECORD 32*I0-31
944 READ#3: C$
945 K7=ORD(C$[1:1])
946 K7=256*K7+ORD(C$[2:2])
947 IF K7=12074 THEN 953
948 FOR K7=1 TO 32
949 K0(K7)=ORD(C$[K7:K7])
950 NEXT K7
```

TXGPHK

```
951 K7=0
952 GOTO 954
953 K7=1
954 FNT7=K7
955 END DEF
956 K$= CHR$(27)&"%0A"&CHR$(27)&"E"
957 FOR K7=1 TO 256
958 K$= K$&" "
959 NEXT K7
960 CALL Send (K$)
961 CLOSE#1
962 CLOSE#2
963 CLOSE#3
964 CLOSE#4
965 END
```

TXGPHK

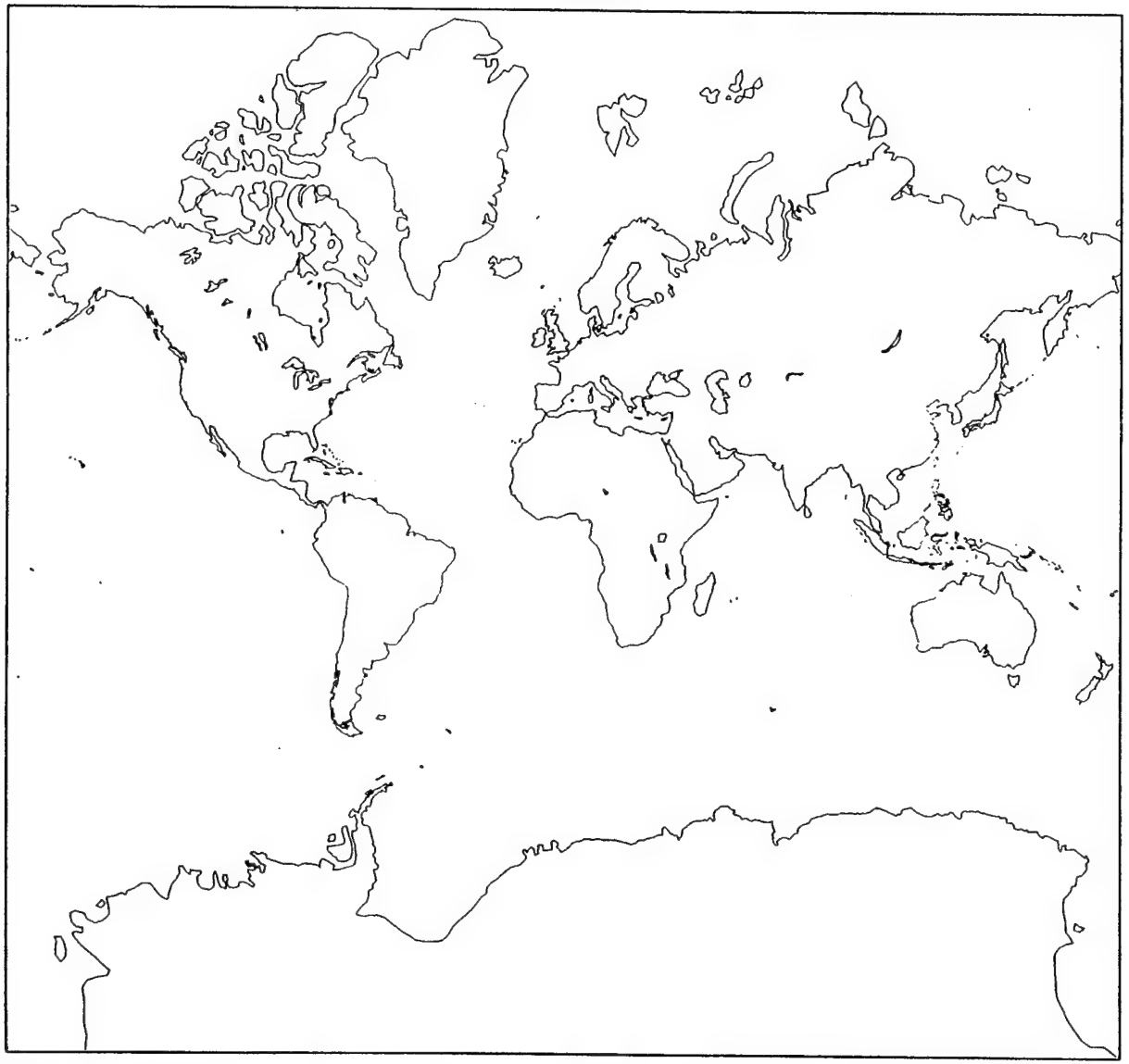
APPENDIX X

SAMPLES

WLDTYP

```
      1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
 1    P R I N T                                                                  W L D T Y P
 2    * * * *
 3    W L , 1 6 9 Q , I S , 0 , 8 ,
 4    M A , - 7 6 2 , + 7 6 2 , 0 0 0 0 , 2 4 0 0 ,
 5    M S , 0 , + 1 , + 1 , 0 , 0 C , 0 0 0 0 , 5 7 0 0 ,
 6    X Y , - 3 0 0 0 , - 3 2 0 0 , N X
 7    X Y , - 3 0 0 0 , + 3 2 0 0 , N X
 8    X Y , + 3 0 0 0 , + 3 2 0 0 , N X
 9    X Y , + 3 0 0 0 , - 3 2 0 0 , N X ( 3 2 )
10    R V ( 1 , 2 ) R V ( 2 , 3 ) R V ( 3 , 4 ) R V ( 4 , 1 ) .
11    W O R L D
12    M S , 0 , + 1 , + 1 , 0 , 0 C , + 3 1 6 0 , 5 7 0 0 ,
13    M S , + 6 , 0 , 0 , - 6 , X Y , 0 , 0 ,
14    N J X N V P P N T R ( 3 2 ) Q C ( 1 , 5 # 0 ) .
15    W O R L D   D A T A   B A N K   Z E R O
16    W L , 1 0 0 Q , I S , 0 , 8 ,
17    M S , 0 , + 1 , + 1 , 0 , 0 C , - 3 1 6 0 , 5 7 0 0 ,
18    M S , + 1 , 0 , 0 , - 1 , X Y , 0 , 0 ,
19    N J X N V P P N T R ( 3 2 ) Q C ( 1 , 2 0 # 0 ) .
20    M E R C A T O R   P R O J E C T I O N
21    M S , 0 , + 1 , + 1 , 0 , 0 C , - 3 3 1 0 , 5 7 0 0 ,
22    M S , + 3 , 0 , 0 , - 3 , X Y , 0 , 0 ,
23    N J X N V P P N T I ( 3 2 ) Q C ( 1 , 1 9 # 0 ) .
24    D i g i t i z a t i o n   a t   D a h l g r e n   V A
25    M S , 0 , + 1 , + 1 , 0 , 0 C , - 3 1 6 0 , 2 5 0 0 ,
26    M S , + 3 , 0 , 0 , - 3 , X Y , 0 , 0 ,
27    N J X N V P P N C R ( 3 2 ) Q L ( 1 , 2 7 # 0 ) .
28    T r u e   B A S I C   a n d   L a s e r j e t   I I I p
29    M S , 0 , + 1 , + 1 , 0 , 0 C , - 3 1 6 0 , 8 9 0 0 ,
30    M S , + 3 , 0 , 0 , - 3 , X Y , 0 , 0 ,
31    N J X N V P P N C R ( 3 2 ) Q R ( 1 , 2 8 # 0 ) *
32    F R A M E
33    / *
```

WORLD



Digitization at Dahlgren VA

WORLD DATA BANK ZERO

MERCATOR PROJECTION

True BASIC and Laserjet IIIp

USATYP

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	P	R	I	N	T																						U	S	A	T	Y	P
2	*	*	*	*																												
3	W	L	,	1	6	9	Q	,	I	S	,	0	,	8	,																	
4	M	A	,	−	7	6	2	,	+	7	6	2	,	0	0	0	0	,	2	4	0	0	,									
5	M	S	,	0	,	+	1	,	+	1	,	0	,	0	C	,	0	0	0	0	,	5	7	0	0	,						
6	X	Y	,	−	2	9	8	7	,	−	4	2	6	7	,	N	X															
7	X	Y	,	−	2	9	8	7	,	+	4	2	6	7	,	N	x															
8	X	Y	,	+	2	9	8	7	,	+	4	2	6	7	,	N	X															
9	X	Y	,	+	2	9	8	7	,	−	4	2	6	7	,	N	X	(	3	2	)											
10	R	V	(	1	,	2	)	R	V	(	2	,	3	)	R	V	(	3	,	4	)	R	V	(	4	,	1	)	.			
11	U	N	I	T	E	D		S	T	A	T	E	S																			
12	M	S	,	0	,	+	1	,	+	1	,	0	,	0	C	,	+	3	1	5	0	,	5	7	0	0	,					
13	M	S	,	+	6	,	0	,	0	,	−	6	,	X	Y	,	0	,	0	,													
14	N	J	X	N	V	P	P	N	T	R	(	3	2	)	Q	C	(	1	,	1	3	#	0	)	.							
15	U	S	A		D	A	T	A		B	A	N	K																			
16	W	L	,	1	0	0	Q	,	I	S	,	0	,	8	,																	
17	M	S	,	0	,	+	1	,	+	1	,	0	,	0	C	,	−	3	1	5	0	,	5	7	0	0	,					
18	M	S	,	+	4	,	0	,	0	,	−	4	,	X	Y	,	0	,	0	,													
19	N	J	X	N	V	P	P	N	T	R	(	3	2	)	Q	C	(	1	,	1	3	#	0	)	.							
20	M	E	R	C	A	T	O	R		P	R	O	J	E	C	T		O	N													
21	M	S	,	0	,	+	1	,	+	1	,	0	,	0	C	,	−	3	3	0	0	,	5	7	0	0	,					
22	M	S	,	+	3	,	0	,	0	,	−	3	,	X	Y	,	0	,	0	,													
23	N	J	X	N	V	P	P	N	T	H	(	3	2	)	Q	C	(	1	,	1	9	#	0	)	.							
24	D	i	g	i	+	i	z	a	+	i	o	n		a	+		D	a	h	l	g	r	a	n		V	A				
25	M	S	,	0	,	+	1	,	+	1	,	0	,	0	C	,	−	3	1	5	0	,	1	4	3	3	,					
26	M	S	,	+	3	,	0	,	0	,	−	3	,	X	Y	,	0	,	0	,													
27	N	J	X	N	V	P	P	N	C	R	(	3	2	)	Q	L	(	1	,	3	7	#	0	)	.							
28	T	r	u	e		B	A	S	I	C		o	n	d		L	a	s	e	r	j	e	t		I	T	I	P			
29	M	S	,	0	,	+	1	,	+	1	,	0	,	0	C	,	−	3	1	5	0	,	9	9	6	7	,					
30	M	S	,	+	3	,	0	,	0	,	−	3	,	X	Y	,	0	,	0	,													
31	N	J	X	N	V	P	P	N	C	R	(	3	2	)	Q	R	(	1	,	2	8	#	0	)	.							

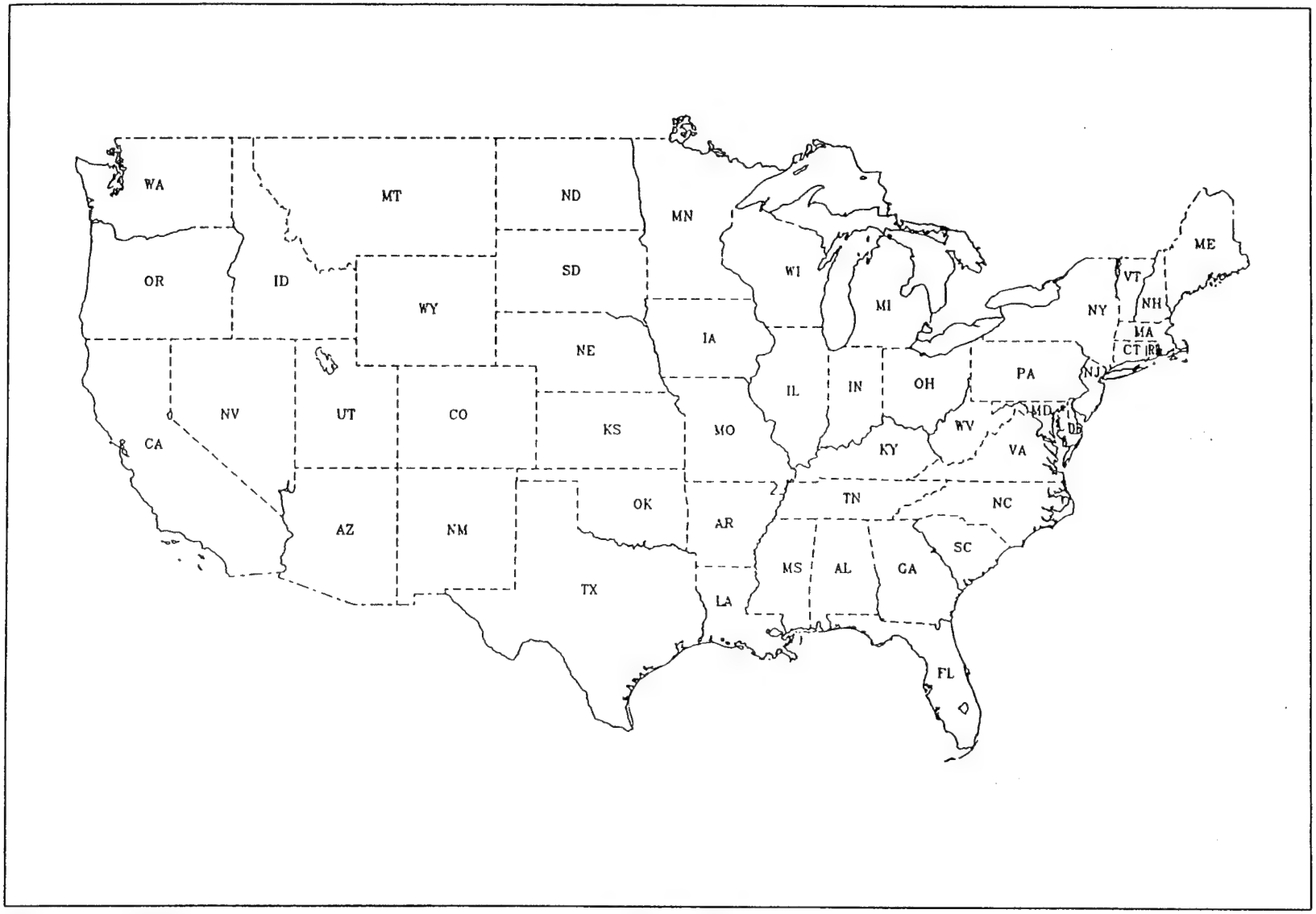
```
    1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
32  A  L
33  M  S  ,  0  ,  4  4  ,  0  ,  0  C  ,  -  1  8  7  ,  1  7  3  2  ,  X  Y  ,  0  ,  0  ,
34  M  S  ,  +  3  ,  0  ,  0  ,  -  3  ,  C  R  (  3  2  )  Q  C  (  1  ,  2  #  0  )  ,  ,
35  A  Z
36  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  -  1  2  6  ,  0  9  0  8  ,  X  Y  ,  0  ,  0  ,
37
38  A  R
39  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  -  1  1  3  ,  1  5  3  7  ,  X  Y  ,  0  ,  0  ,
40
41  C  A
42  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  0  1  7  ,  0  5  9  8  ,  X  Y  ,  0  ,  0  ,
43  M  S  ,  +  3  ,  0  ,  0  ,  -  3  ,  C  R  (  3  2  )  Q  C  (  1  ,  2  #  0  )  ,
44  C  O
45  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  0  6  6  ,  1  0  9  3  ,  X  Y  ,  0  ,  0  ,
46
47  C  T
48  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  1  8  0  ,  2  2  0  3  ,  X  Y  ,  0  ,  0  ,
49
50  D  E
51  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  0  4  8  ,  2  1  1  1  ,  X  Y  ,  0  ,  0  ,
52
53  F  L
54  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  -  3  6  1  ,  1  9  0  2  ,  X  Y  ,  0  ,  0  ,
55
56  E  A
57  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  -  1  8  7  ,  1  8  4  0  ,  X  Y  ,  0  ,  0  ,
58
59  I  D
60  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  2  8  8  ,  0  8  0  3  ,  X  Y  ,  0  ,  0  ,
61
62  I  L
63  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  1  0  9  ,  1  6  4  8  ,  X  Y  ,  0  ,  0  ,
64
65  I  N
66  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  1  1  6  ,  1  7  5  3  ,  X  Y  ,  0  ,  0  ,
67
68  I  A
69  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  1  9  6  ,  1  5  1  3  ,  X  Y  ,  0  ,  0  ,
70
71  K  S
72  M  S  ,  0  ,  4  ,  4  ,  0  ,  0  C  ,  +  0  4  2  ,  1  3  5  2  ,  X  Y  ,  0  ,  0  ,
73
```

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
74	K	Y																														
75	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	1	1	,	1	8	0	9	,	X	Y	,	0	,	0	,	
76																																
77	L	A																														
78	M	S	,	0	,	4	,	4	,	0	,	0	C	,	−	2	4	3	,	1	5	3	7	,	X	Y	,	0	,	0	,	
79																																
80	M	E																														
81	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	3	5	6	,	2	3	2	2	,	X	Y	,	0	,	0	,	
82																																
83	M	D																														
84	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	7	8	,	2	0	5	7	,	X	Y	,	0	,	0	,	
85																																
86	M	A																														
87	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	2	1	0	,	2	2	2	3	,	X	Y	,	0	,	0	,	
88																																
89	M	I																														
90	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	2	5	1	,	1	8	0	0	,	X	Y	,	0	,	0	,	
91																																
92	M	N																														
93	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	3	9	9	,	1	4	7	0	,	X	Y	,	0	,	0	,	
94																																
95	M	S																														
96	M	S	,	0	,	4	,	4	,	0	,	0	C	,	−	1	8	7	,	1	6	4	8	,	X	Y	,	0	,	0	,	
97																																
98	M	O																														
99	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	4	2	,	1	5	3	7	,	X	Y	,	0	,	0	,	
100																																
101	M	T																														
102	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	4	3	0	,	0	9	8	2	,	X	Y	,	0	,	0	,	
103																																
104	N	E																														
105	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	1	7	4	,	1	3	0	8	,	X	Y	,	0	,	0	,	
106																																
107	N	V																														
108	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	6	6	,	0	7	2	2	,	X	Y	,	0	,	0	,	
109																																
110	N	H																														
111	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	2	5	7	,	2	2	3	6	,	X	Y	,	0	,	0	,	
112																																
113	N	J																														
114	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	1	4	2	,	2	1	3	8	,	X	Y	,	0	,	0	,	
115																																

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
116	N	M																														
117	M	S	,	0	,	4	,	4	,	0	,	0	C	,	-	1	2	6	,	1	0	9	2	,	X	Y	,	0	,	0	,	
118																																
119	N	Y																														
120	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	2	4	5	,	2	1	4	7	,	X	Y	,	0	,	0	,	
121																																
122	N	C																														
123	M	S	,	0	,	4	,	4	,	0	,	0	C	,	-	0	7	7	,	1	9	9	4	,	X	Y	,	0	,	0	,	
124																																
125	N	D																														
126	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	4	5	5	,	1	2	8	4	,	X	Y	,	0	,	0	,	
127																																
128	O	H																														
129	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	1	3	2	,	1	8	6	7	,	X	Y	,	0	,	0	,	
130																																
131	O	K																														
132	M	S	,	0	,	4	,	4	,	0	,	0	C	,	-	0	8	2	,	1	4	0	4	,	X	Y	,	0	,	0	,	
133																																
134	O	R																														
135	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	2	8	8	,	0	5	9	8	,	X	Y	,	0	,	0	,	
136																																
137	P	A																														
138	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	1	4	0	,	2	0	3	2	,	X	Y	,	0	,	0	,	
139																																
140	R	I																														
141	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	1	8	0	,	2	2	3	8	,	X	Y	,	0	,	0	,	
142																																
143	S	C																														
144	M	S	,	0	,	4	,	4	,	0	,	0	C	,	-	1	5	1	,	1	9	3	0	,	X	Y	,	0	,	0	,	
145																																
146	S	D																														
147	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	3	0	7	,	1	2	8	4	,	X	Y	,	0	,	0	,	
148																																
149	T	N																														
150	M	S	,	0	,	4	,	4	,	0	,	0	C	,	-	0	7	0	,	1	7	4	7	,	X	Y	,	0	,	0	,	
151																																
152	T	X																														
153	M	S	,	0	,	4	,	4	,	0	,	0	C	,	-	2	2	5	,	1	3	1	5	,	X	Y	,	0	,	0	,	
154																																
155	U	T																														
156	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	6	6	,	0	9	0	8	,	X	Y	,	0	,	0	,	
157																																

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
158	V	T																														
159	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	3	0	1	,	3	2	0	4	,	X	Y	,	0	,	0	,	
160																																
161	V	A																														
162	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	1	1	,	3	0	1	9	,	X	Y	,	0	,	0	,	
163																																
164	W	A																														
165	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	4	4	9	,	0	5	9	8	,	X	Y	,	0	,	0	,	
166																																
167	W	V																														
168	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	0	5	1	,	1	9	3	2	,	X	Y	,	0	,	0	,	
169																																
170	W	I																														
171	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	3	0	7	,	1	6	4	8	,	X	Y	,	0	,	0	,	
172																																
173	W	Y																														
174	M	S	,	0	,	4	,	4	,	0	,	0	C	,	+	2	4	2	,	1	0	4	3	,	X	Y	,	0	,	0	,	
175	M	S	,	+	3	,	0	,	0	,	-	3	,	C	R	(	3	2	)	Q	C	(	1	,	2	$	0	)	*	:	,		
176	F	R	A	M	E																											
177	/	*																														

UNITED STATES



Digitization at Dahlgren VA

USA DATA BANK

MERCATOR PROJECTION

True BASIC and Laserjet IIIp

GREEK

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	P	R	I	N	T																							G	R	E	E	K
2	G	R	E	E	K																											
3	M	A	,	-	6	2	5	,	+	6	2	5	,	0	0	0	0	,	1	8	8	0	,									
4	M	S	,	0	,	6	,	6	,	0	,	I	S	,	C	,	8	,	W	L	,	1	0	0	2	,						
5	O	C	,	0	0	0	0	,	0	0	0	0	,	X	Y	,	0	0	0	0	,	0	1	6	0	,						
6	N	J	X	N	V	P	P	N	C	S	(	3	2	)	Q	C	(	1	,	5	#	0	)	.								
7	P	N	C	G																												
8	H	V	,	0	0	0	,	0	2	0	,	P	N	C	R	(	3	2	)	Q	C	(	1	,	4	#	0	)	.			
9	A	S	C	I	I		V	F		C	R		V	S		V	T		0	1		V	Q									
10	H	V	,	0	0	0	,	0	2	0	,	X	H	C	R	(	2	3	)	X	N	P	N	(	3	2	)					
11	Q	C	(	1	,	5	#	-	2	0	0	)	Q	C	(	7	,	1	4	$	0	)										
12	Q	C	(	1	6	,	2	3	$	+	2	0	0	)	.																	
13	A		a		A		a		A		a																					
14	H	V	,	0	0	0	,	0	2	0	,	X	N	S	S	,																
15	(	A	N	V	P	P	N	C	G	(	8	)	V	T	P	N	C	G	(	1	2	)	C	R	(	3	2	)				
16	Q	C	(	1	,	3	#	-	2	0	0	)	Q	C	(	5	,	7	#	0	)											
17	Q	C	(	9	,	1	1	#	+	2	0	0	)	.																		
13	A		a		A		a		A		a																					
18	B		b		B		b		B		b																					
23	C		c		C		c		C		c																					
28	D		d		D		d		D		d																					
33	E		e		E		e		E		e																					
38	F		f		F		f		F		f																					
43	G		g		G		g		G		g																					
48	H		h		H		h		H		h																					
53	I		i		I		i		I		i																					
58	K		k		K		k		K		k																					
63	L		l		L		l		L		l																					
68	M		m		M		m		M		m																					
73	N		n		N		n		N		n																					
78	O		o		O		o		O		o																					
83	P		p		P		p		P		p																					
88	Q		q		Q		q		Q		q																					
93	R		r		R		r		R		r																					
98	S		s		S		s		S		s																					
103	T		t		T		t		T		t																					
108	U		u		U		u		U		u																					
113	W		w		W		w		W		w																					
118	X		x		X		x		X		x																					
123	Y		y		Y		y		Y		y																					
128	Z		z		Z		z		Z		z																					
133	F	R	A	M	E																											
134	/	*																														

GREEK

PNCG

ASCII	VP or VS	VT or VQ
A a	A α	A α
B b	B β	B β
C c	X χ	X χ
D d	Δ δ	∇ ∂
E e	E ε	E ϵ
F f	Φ φ	Φ ϕ
G g	Γ γ	Γ γ
H h	H η	H η
I i	I ι	I ι
K k	K κ	K κ
L l	Λ λ	Λ λ
M m	M μ	M μ
N n	N ν	N ν
O o	O o	O o
P p	Π π	$\prod$ π
Q q	Θ ϑ	Θ θ
R r	P ρ	P ρ
S s	Σ σ	$\sum$ σ
T t	T τ	T τ
U u	Υ υ	Υ υ
W w	Ω ω	Ω ω
X x	Ξ ξ	Ξ ξ
Y y	Ψ ψ	Ψ ψ
Z z	Z ζ	Z ζ

SYMROL

```
      1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
 1    P R I N T                                                                  S Y M B O L
 2    S Y M B O L
 3    M A , - 6 2 5 , + 6 2 5 , 0 0 0 0 , 1 9 8 0 ,
 4    M S , 0 , 5 , 5 , 0 , I S , 0 , 8 , W L , 1 0 0 Q ;
 5    O C , 0 0 0 0 , 0 0 0 0 , X Y , 0 0 0 0 , 0 2 0 0 ,
 6    N J X N V P P N C R ( 3 2 ) Q C ( 1 , 6 $ 0 ) .
 7    P N
 8    H V , 0 0 0 , 0 3 0 , P N C R ( 3 2 ) Q C ( 1 , 2 # Q ) .
 9    A S C I I                V P V S V T V Q
10    H V , 0 0 0 , 0 2 0 , P N C R ( 1 7 ) P N ( 3 2 )
11    Q C ( 1 , 5 # - 5 0 0 ) Q C ( 1 0 , 1 1 # - 2 5 0 )
12    Q C ( 1 2 , 1 3 # 0 ) Q C ( 1 4 , 1 5 # + 2 5 0 )
13    Q C ( 1 6 , 1 7 # + 5 0 0 ) .

14    * ! ! ! !
15    H V , 0 0 0 , 0 3 0 , 0 7 1 4 ,
16    V P ( 2 ) V S ( 3 ) V T ( 4 ) V Q ( 5 ) V P ( 3 2 )
17    Q C ( 1 # - 5 0 0 ) Q C ( 2 # - 2 5 0 ) Q C ( 3 # 0 )
18    Q C ( 4 # + 2 5 0 ) Q C ( 5 # + 5 0 0 ) .
```

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
14	*	!	!	!	!																											
15	H	V	,	0	0	0	,	0	2	0	,	0	7	1	4	,															
19	*	"	"	"	"																											
20	H	V	,	0	0	0	,	0	2	0	,	0	7	1	7	,															
24	*	#	*	*	#																											
25	H	V	,	0	0	0	,	0	2	0	,	0	7	3	3	,															
29	*	$	$	$	$																											
30	H	V	,	0	0	0	,	0	2	0	,	0	7	1	9	,															
34	*	%	%	%	%																											
35	H	V	,	0	0	0	,	0	2	0	,	0	6	9	7	,															
39	*	&	&	&	&																											
40	H	V	,	0	0	0	,	0	2	0	,	0	7	3	4	,															
44	*	'	'	'	'																											
45	H	V	,	0	0	0	,	0	2	0	,	0	7	1	6	,															
49	*	(	(	(	(																											
50	H	V	,	0	0	0	,	0	2	0	,	0	7	2	1	,															
54	*	)	)	)	)																											
55	H	V	,	0	0	0	,	0	2	0	,	0	7	2	2	,															
59	*	*	*	*	*																											
60	H	V	,	0	0	0	,	0	2	0	,	0	7	2	8	,															
64	*	+	+	+	+																											
65	H	V	,	0	0	0	,	0	2	0	,	0	7	2	5	,															
69	*	,	,	,	,																											
70	H	V	,	0	0	0	,	0	2	0	,	0	7	1	1	,															
74	*	-	-	-	-																											
75	H	V	,	0	0	0	,	0	2	0	,	0	7	2	4	,															
79	*	.	.	.	.																											
80	H	V	,	0	0	0	,	0	2	0	,	0	7	2	9	,															
84	*	/	/	/	/																											
85	H	V	,	0	0	0	,	0	2	0	,	0	7	3	0	,															
89	*	:	:	:	:																											
90	H	V	,	0	0	0	,	0	2	0	,	0	7	1	2	,															
94	*	;	;	;	;																											
95	H	V	,	0	0	0	,	0	2	0	,	0	7	1	3	,															
99	*	<	<	<	<																											
100	H	V	,	0	0	0	,	0	2	0	,	0	6	9	1	,															
104	*	=	=	=	=																											
105	H	V	,	0	0	0	,	0	2	0	,	0	7	2	6	,															
109	*	>	>	>	>																											
110	H	V	,	0	0	0	,	0	2	0	,	0	6	9	2	,															
114	*	?	?	?	?																											
115	H	V	,	0	0	0	,	0	2	0	,	0	7	1	5	,															
119	*	@	@	@	@																											
120	H	V	,	0	0	0	,	0	2	0	,	0	6	9	0	,															

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
124	*	[	[	[	[																											
125	H	V	,	0	0	0	,	0	2	0	,	0	6	9	3	,																
129	*	\	\	\	\																											
130	H	V	,	0	0	0	,	0	2	0	,	0	5	8	4	,																
134	*	]	]	]	]																											
135	H	V	,	0	0	0	,	0	2	0	,	0	6	9	4	,																
139	*	^	^	^	^																											
140	H	V	,	0	0	0	,	0	2	0	,	0	5	8	5	,																
144	*	-	-	-	-																											
145	H	V	,	0	0	0	,	0	2	0	,	0	7	2	4	,																
149	*	{	{	{	{																											
150	H	V	,	0	0	0	,	0	2	0	,	0	6	9	5	,																
154	*	1	1	1	1																											
155	H	V	,	0	0	0	,	0	2	0	,	0	7	2	3	,																
159	*	}	}	}	}																											
160	H	V	,	0	0	0	,	0	2	0	,	0	6	9	6	,																
164	F	R	A	M	E																											
165	/	*																														

SYMBOL

PN

ASCII	VP	VS	VT	VQ
!	!	!	!	!
"	"	"	"	"
#	#	#	√	
$	$	$	∫	
%	%	%	%	%
&	&	&	&	&
'	'	'	'	'
(	(	(	(	
)	)	)	)	
*	*	*	×	·
+	+	+	+	±
,	,	,	,	,
−	−	−	−	∓
.	.	.	.	.
/	/	/	/	≠
:	:	:	:	:
;	;	;	;	;
<	<	<	≦	⟨
=	=	=	=	≡
>	>	>	≧	⟩
?	?	?	?	?
@	@	@	°	∞
[	[	[	[	
\	\	\	§	†
]	]	]	]	
^	^	^	∩	∪
_	→	↑	←	↓
{	{	{	{	
|	|	|	|	‖
}	}	}	}	

TEST

```
      1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
 1    P  R  I  N  T                                                                        T  E  S  T
 2    T  E  S  T
 3    M  A  ,  -  6  2  5  ,  +  6  2  E  ,  0  0  0  0  ,  1  8  8  0  ,
 4    I  S  ,  0  ,  8  ,  W  L  ,  1  0  0  Q  .
 5    M  S  ,  0  ,  6  ,  6  ,  0  ,  0  C  ,  0  0  0  0  ,  0  0  0  0  ,
 6    M  S  ,  0  ,  6  ,  6  ,  0  ,  X  Y  ,  0  0  0  0  ,  0  1  0  0  ,
 7    N  I  X  N  V  P  P  N  C  R  (  3  2  )  Q  C  (  1  ,  4  #  0  )  .
 8    S  i  n     2  9        =     2     S  i  n     9     C  O  S     9
 9    H  V  ,  0  0  0  ,  +  7  2  ,  X  H  V  P  ,
10    C  R  (  5  )  V  Q  C  G  (  6  )  V  P  C  R  (  1  5  )  V  Q  C  G  (  1  6  )
11    V  P  C  R  (  3  1  )  V  Q  C  G  (  3  2  )  V  P  C  R  (  3  2  )
12    Q  C  (  1  ,  3  2  #  0  )  .
13    *  *  1  /  2  (  x  p  2     +     y  p  2     +     z  p  2  )  *  *
14    H  V  ,  0  0  0  ,  +  9  6  ,  X  H  V  P  ,
15    H  V  ,  0  0  0  ,  -  2  4  ,  N  X  H  V  ,  0  0  0  ,  +  4  8  ,  N  X
16    H  V  ,  0  0  0  ,  -  2  4  ,  P  I  (  5  )  P  11  (  6  )
17    C  I  (  7  )  S  B  (  8  )  S  P  (  9  )  P  N  (  1  1  )
18    C  I  (  1  3  )  S  B  (  1  4  )  S  P  (  1  5  )  P  N  (  1  7  )
19    C  I  (  1  9  )  S  B  (  2  0  )  S  P  (  2  1  )  P  N  (  2  3  )
20    H  V  ,  0  0  0  ,  +  2  4  ,  N  X  H  V  ,  0  0  0  ,  -  4  8  ,  N  X
21    H  V  ,  0  0  0  ,  +  2  4  ,  N  X  (  3  2  )  D  V  (  3  /  5  )
22    Q  C  (  1  ,  3  4  #  0  )  R  V  (  1  ,  3  4  )  R  V  (  2  ,  3  3  )  .
23    #  -  x  2     +     y  2
24    H  V     0  0  0     +  9  6  ,  X  H  V  T  ,
25    (  2  )  V  P  P  N  C  I  (  3  )  S  P  (  4  )  P  N  (  8  )  S  P  (  9  )
26    P  N  (  3  2  )  R  D  (  3  ,  9  )  Q  C  (  1  ,  4  #  0  )  .
27    #  -  *  a  /  b     +     c  *
28    H  V  ,  0  0  0  ,  +  9  6  ,  X  H  V  Q  ,
29    (  2  )  N  X  V  P  C  I  (  1  0  )  N  X  C  R  (  3  2  )
30    D  V  (  4  /  6  ,  1  0  )  R  D  (  3  ,  1  1  )  Q  C  (  1  ,  1  1  #  0  )  .
31    #  -  *  a     +     b  /  c  *
32    H  V  ,  0  0  0  ,  +  9  6  ,  X  H  V  Q  ,
33    (  2  )  N  X  V  P  C  I  (  1  0  )  N  X  C  R  (  3  2  )
34    D  V  (  4  ,  8  /  1  0  )  R  D  (  3  ,  1  1  )  Q  C  (  1  ,  1  1  #  0  )  .
35    m     =     m  0  /  #  -  1     -     V  2  /  C  2
36    H  V  ,  0  0  0  ,  +  9  6  ,  X  H  V  P  ,
37    C  I  (  5  )  S  B  (  6  )  P  N  (  7  )  V  Q  (  9  )
38    V  P  (  1  4  )  S  P  (  1  5  )  P  N  (  1  7  )  S  P  (  1  8  )
39    P  N  C  R  (  3  2  )  D  V  (  1  4  ,  1  5  /  1  7  ,  1  8  )
40    R  D  (  1  0  ,  1  8  )  D  V  (  5  ,  6  /  8  ,  1  8  )
41    L  L  (  8  ,  1  8  #  +  3  0  )  Q  C  (  1  ,  1  8  #  0  )  .
```

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
42	#	a	b		f	(	x	)		d	x																					
43	H	V	,	0	0	0	,	1	9	2	,	X	H	N	Q	,																
44	(	1	)	V	P	P	I	C	I	(	3	)	P	N	(	1	1	)	C	R	(	3	2	)								
45	L	M	(	2	-	3	)	Q	C	(	1	,	1	1	#	0	)	.														
46	e	z		=		S	n	=	0	@		z	n	/	n	!																
47	H	V	,	0	0	0	,	1	4	4	,	X	H	V	P	,																
48	P	N	C	I	(	1	)	S	P	(	2	)	P	N	(	5	)	V	Q	C	G	(	6	)								
49	V	P	P	I	C	I	(	9	)	V	Q	(	1	0	)	V	P	P	N	(	1	2	)	S	P	(	1	3	)				
50	P	N	(	1	6	)	C	R	(	3	2	)																				
51	L	M	(	7	,	9	-	1	0	)	D	V	(	1	2	,	1	3	/	1	5	,	1	6	)							
52	Q	C	(	1	,	1	6	#	0	)	.																					
53	p	(	z	)		=		p	k	=	1	n	-	m	+	1		(	z		-		z	k	)							
54	H	V	,	0	0	0	,	1	4	4	,	X	H	V	P	,																
55	P	N	C	I	(	7	)	V	Q	C	G	(	8	)	V	P	P	I	C	I	(	1	6	)								
56	P	N	(	2	3	)	S	B	(	2	4	)	P	N	C	R	(	3	2	)												
57	L	M	(	9	,	1	1	-	1	2	,	1	6	)	Q	C	(	1	,	2	5	#	0	)	.							
58	-	*	*	*	*	-																										
59	H	V	,	0	0	0	,	+	9	6	,	X	N	V	P	,																
60	P	N	C	R	(	1	)	N	X	H	V	,	+	2	,	-	1	6	,	N	X											
61	H	V	,	+	1	8	,	+	3	2	,	1	1	X	H	V	,	+	2	,	-	1	6	,	N	X	(	3	2	)			
62	Q	C	(	1	,	6	#	0	)	.	V	(	3	,	+	)	*															
63	F	R	A	M	E																											
64	/	*																														

TEST

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\overline{\frac{1}{2}(x_p{}^2 + y_p{}^2 + z_p{}^2)}$$

$$\sqrt{x^2 + y^2}$$

$$\sqrt{\frac{a}{b + c}}$$

$$\sqrt{\frac{a + b}{c}}$$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$\int_a^b f(x)\, dx$$

$$e^z = \sum_{n=0}^{\infty} \frac{z^n}{n!}$$

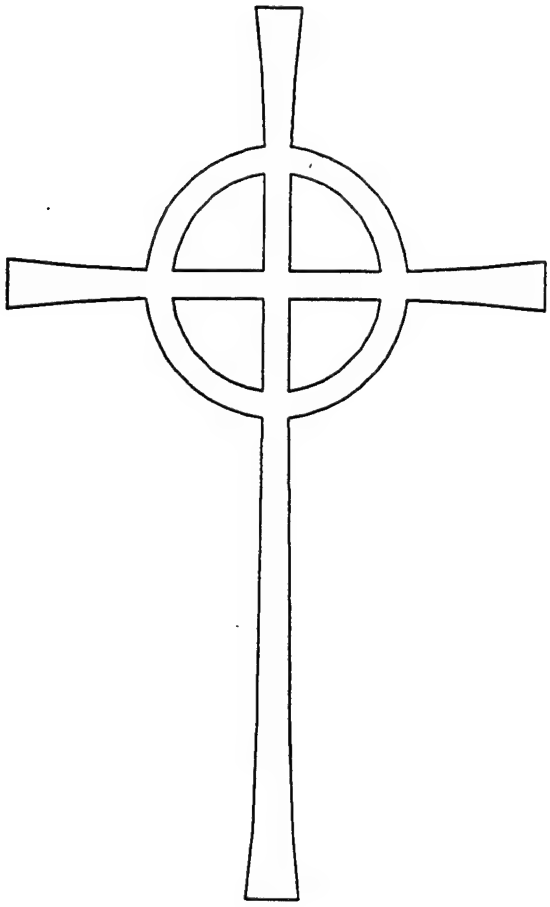
$$p(z) = \prod_{k=1}^{n-m+1} (z - z_k)$$

KROSS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
																				C	R	O	S	S		O	F		I	O	N	A
1	P	L	O	T																												
2	W	L	,	2	0	0	0	,																								
3	M	S	,	0	,	1	8	,	1	8	,	0	,	0	C	,	0	0	0	0	,	0	2	0	0	,						
4	X	Y	,	0	0	0	0	,	-	0	8	0	,	P	V	,	-	0	0	7	,	-	0	8	0	,						
5	X	Y	,	-	0	0	7	,	-	0	8	0	,	P	V	,	-	0	0	5	,	-	0	6	0	,						
6	X	Y	,	-	0	0	5	,	-	0	6	0	,	P	V	,	-	0	0	4	,	-	0	3	9	,						
7	X	Y	,	-	0	0	4	,	-	0	3	9	,	P	V	,	-	0	0	9	,	-	0	3	8	,						
8	X	Y	,	-	0	0	9	,	-	0	3	8	,	P	V	,	-	0	1	5	,	-	0	3	6	,						
9	X	Y	,	-	0	1	5	,	-	0	3	6	,	P	V	,	-	0	2	1	,	-	0	3	3	,						
10	X	Y	,	-	0	2	1	,	-	0	3	3	,	P	V	,	-	0	2	5	,	-	0	3	0	,						
11	X	Y	,	-	0	2	5	,	-	0	3	0	,	P	V	,	-	0	3	0	,	-	0	2	5	,						
12	X	Y	,	-	0	3	0	,	-	0	2	5	,	P	V	,	-	0	3	3	,	-	0	2	1	,						
13	X	Y	,	-	0	3	3	,	-	0	2	1	,	P	V	,	-	0	3	6	,	-	0	1	5	,						
14	X	Y	,	-	0	3	6	,	-	0	1	5	,	P	V	,	-	0	3	8	,	-	0	0	9	,						
15	X	Y	,	-	0	3	8	,	-	0	0	9	,	P	V	,	-	0	3	9	,	-	0	0	4	,						
16	X	Y	,	-	0	3	9	,	-	0	0	4	,	P	V	,	-	0	6	0	,	-	0	0	5	,						
17	X	Y	,	-	0	6	0	,	-	0	0	5	,	P	V	,	-	0	8	0	,	-	0	0	7	,						
18	X	Y	,	-	0	8	0	,	-	0	0	7	,	P	V	,	-	0	8	0	,	0	0	0	0	,						
19	X	Y	,	-	0	8	0	,	0	0	0	0	,	P	V	,	-	0	8	0	,	+	0	0	7	,						
20	X	Y	,	-	0	8	0	,	+	0	0	7	,	P	V	,	-	0	6	0	,	+	0	0	5	,						
21	X	Y	,	-	0	6	0	,	+	0	0	5	,	P	V	,	-	0	3	9	,	+	0	0	4	,						
22	X	Y	,	-	0	3	9	,	+	0	0	4	,	P	V	,	-	0	3	8	,	+	0	0	9	,						
23	X	Y	,	-	0	3	8	,	+	0	0	9	,	P	V	,	-	0	3	6	,	+	0	1	5	,						
24	X	Y	,	-	0	3	6	,	+	0	1	5	,	P	V	,	-	0	3	3	,	+	0	2	1	,						
25	X	Y	,	-	0	3	3	,	+	0	2	1	,	P	V	,	-	0	3	0	,	+	0	2	5	,						
26	X	Y	,	-	0	3	0	,	+	0	2	5	,	P	V	,	-	0	2	5	,	+	0	3	0	,						
27	X	Y	,	-	0	2	5	,	+	0	3	0	,	P	V	,	-	0	2	1	,	+	0	3	3	,						
28	X	Y	,	-	0	2	1	,	+	0	3	3	,	P	V	,	-	0	1	5	,	+	0	3	6	,						
29	X	Y	,	-	0	1	5	,	+	0	3	6	,	P	V	,	-	0	0	9	,	+	0	3	8	,						
30	X	Y	,	-	0	0	9	,	+	0	3	8	,	P	V	,	-	0	0	4	,	+	0	3	9	,						
31	X	Y	,	-	0	0	4	,	+	0	3	9	,	P	V	,	-	0	0	5	,	+	1	3	0	,						
32	X	Y	,	-	0	0	5	,	+	1	3	0	,	P	V	,	-	0	0	6	,	+	1	6	0	,						
33	X	Y	,	-	0	0	6	,	+	1	6	0	,	P	V	,	-	0	0	8	,	+	1	8	0	,						
34	X	Y	,	-	0	0	8	,	+	1	8	0	,	P	V	,	0	0	0	0	,	+	1	8	0	,						
35	X	Y	,	0	0	0	0	,	-	0	8	0	,	P	V	,	+	0	0	7	,	-	0	8	0	,						
36	X	Y	,	+	0	0	7	,	-	0	8	0	,	P	V	,	+	0	0	5	,	-	0	6	0	,						
37	X	Y	,	+	0	0	5	,	-	0	6	0	,	P	V	,	+	0	0	4	,	-	0	3	9	,						
38	X	Y	,	+	0	0	4	,	-	0	3	9	,	P	V	,	+	0	0	9	,	-	0	3	8	,						
39	X	Y	,	+	0	0	9	,	-	0	3	8	,	P	V	,	+	0	1	5	,	-	0	3	6	,						
40	X	Y	,	+	0	1	5	,	-	0	3	6	,	P	V	,	+	0	2	1	,	-	0	3	3	,						
41	X	Y	,	+	0	2	1	,	-	0	3	3	,	P	V	,	+	0	2	5	,	-	0	3	0	,						
42	X	Y	,	+	0	2	5	,	-	0	3	0	,	P	V	,	+	0	3	0	,	-	0	2	5	,						
43	X	Y	,	+	0	3	0	,	-	0	2	5	,	P	V	,	+	0	3	3	,	-	0	2	1	,						

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
44	X	Y	,	+	0	3	3	,	−	0	2	1	,	P	V	,	+	0	2	6	,	−	0	1	5	,						
45	X	Y	,	+	0	3	6	,	−	0	1	5	,	P	V	,	+	0	3	8	,	−	0	0	9	,						
46	X	Y	,	+	0	3	8	,	−	0	0	9	,	P	V	,	+	0	3	9	,	−	0	0	4	,						
47	X	Y	,	+	0	3	9	,	−	0	0	4	,	P	V	,	+	0	6	0	,	−	0	0	5	,						
48	X	Y	,	+	0	6	0	,	−	0	0	5	,	P	V	,	+	0	8	0	,	−	0	0	7	,						
49	X	Y	,	+	0	8	0	,	−	0	0	7	,	P	V	,	+	0	8	0	,	0	0	0	0	,						
50	X	Y	,	+	0	8	0	,	0	0	0	0	,	P	V	,	+	0	8	0	,	+	0	0	7	,						
51	X	Y	,	+	0	8	0	,	+	0	0	7	,	P	V	,	+	0	6	0	,	+	0	0	5	,						
52	X	Y	,	+	0	6	0	,	+	0	0	5	,	P	V	,	+	0	3	9	,	+	0	0	4	,						
53	X	Y	,	+	0	3	9	,	+	0	0	4	,	P	V	,	+	0	3	9	,	+	0	0	9	,						
54	X	Y	,	+	0	3	8	,	+	0	0	9	,	P	V	,	+	0	3	6	,	+	0	1	5	,						
55	X	Y	,	+	0	3	6	,	+	0	1	5	,	P	V	,	+	0	3	3	,	+	0	2	1	,						
56	X	Y	,	+	0	3	3	,	+	0	2	1	,	P	V	,	+	0	3	0	,	+	0	3	5	,						
57	X	Y	,	+	0	3	0	,	+	0	2	5	,	P	V	,	+	0	2	5	,	+	0	3	0	,						
58	X	Y	,	+	0	2	5	,	+	0	3	0	,	P	V	,	+	0	2	1	,	+	0	3	3	,						
59	X	Y	,	+	0	2	1	,	+	0	3	3	,	P	V	,	+	0	1	5	,	+	0	3	6	,						
60	X	Y	,	+	0	1	5	,	+	0	3	6	,	P	V	,	+	0	0	9	,	+	0	3	8	,						
61	X	Y	,	+	0	0	9	,	+	0	3	8	,	P	V	,	+	0	0	4	,	+	0	3	9	,						
62	X	Y	,	+	0	0	4	,	+	0	3	9	,	P	V	,	+	0	0	5	,	+	1	3	0	,						
63	X	Y	,	+	0	0	5	,	+	1	3	0	,	P	V	,	+	0	0	6	,	+	1	6	0	,						
64	X	Y	,	+	0	0	6	,	+	1	6	0	,	P	V	,	+	0	0	8	,	+	1	8	0	,						
65	X	Y	,	+	0	0	8	,	+	1	8	0	,	P	V	,	0	0	0	0	,	+	1	3	0	,						
66	X	Y	,	−	0	0	+	,	−	0	0	4	,	P	V	,	−	0	0	4	,	−	0	3	1	,						
67	X	Y	,	−	0	0	4	,	−	0	2	1	,	P	V	,	−	0	0	9	,	−	0	3	0	,						
68	X	Y	,	−	0	0	9	,	−	0	3	0	,	P	V	,	−	0	1	4	,	−	0	2	8	,						
69	X	Y	,	−	0	1	4	,	−	0	2	8	,	P	V	,	−	0	1	9	,	−	0	2	5	,						
70	X	Y	,	−	0	1	1	,	−	0	2	5	,	P	V	,	−	0	2	5	,	−	0	1	9	,						
71	X	Y	,	−	0	2	5	,	−	0	1	9	,	P	V	,	−	0	2	8	,	−	0	1	4	,						
72	X	Y	,	−	0	2	8	,	−	0	1	4	,	P	V	,	−	0	3	0	,	−	0	0	9	,						
73	X	Y	,	−	0	3	0	,	−	0	0	9	,	P	V	,	−	0	2	1	,	−	0	0	4	,						
74	X	Y	,	−	0	3	1	,	−	0	0	4	,	P	V	,	−	0	0	4	,	−	0	0	4	,						
75	X	Y	,	−	0	0	4	,	+	0	0	4	,	P	V	,	−	0	0	4	,	+	0	3	1	,						
76	X	Y	,	−	0	0	4	,	+	0	3	1	,	P	V	,	−	0	0	9	,	+	0	3	0	,						
77	X	Y	,	−	0	0	9	,	+	0	3	0	,	P	V	,	−	0	1	4	,	+	0	2	8	,						
78	X	Y	,	−	0	1	4	,	+	0	2	8	,	P	V	,	−	0	1	9	,	+	0	2	5	,						
79	X	Y	,	−	0	1	9	,	+	0	2	5	,	P	V	,	−	0	2	5	,	+	0	1	9	,						
80	X	Y	,	−	0	2	5	,	+	0	1	9	,	P	V	,	−	0	2	8	,	+	0	1	4	,						
81	X	Y	,	−	0	2	8	,	+	0	1	4	,	P	V	,	−	0	3	0	,	+	0	0	9	,						
82	X	Y	,	−	0	3	0	,	+	0	0	9	,	P	V	,	−	0	3	1	,	+	0	0	4	,						
83	X	Y	,	−	0	3	1	,	+	0	0	4	,	P	V	,	−	0	0	4	,	+	0	0	4	,						

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
84	X	Y	,	+	0	0	4	,	-	0	0	4	,	P	V	,	+	0	0	4	,	-	0	3	1	,						
85	X	Y	,	+	0	0	4	,	-	0	3	1	,	P	V	,	+	0	0	9	,	-	0	3	0	,						
86	X	Y	,	+	0	0	9	,	-	0	3	0	,	P	V	,	+	0	1	4	,	-	0	2	8	,						
87	X	Y	,	+	0	1	4	,	-	0	2	8	,	P	V	,	+	0	1	9	,	-	0	2	5	,						
88	X	Y	,	+	0	1	9	,	-	0	2	5	,	P	V	,	+	0	2	5	,	-	0	1	9	,						
89	X	Y	,	+	0	2	5	,	-	0	1	9	,	P	V	,	+	0	2	8	,	-	0	1	4	,						
90	X	Y	,	+	0	2	8	,	-	0	1	4	,	P	V	,	+	0	3	0	,	-	0	0	9	,						
91	X	Y	,	+	0	3	0	,	-	0	0	9	,	P	V	,	+	0	3	1	,	-	0	0	4	,						
92	X	Y	,	+	0	3	1	,	-	0	0	4	,	P	V	,	+	0	0	4	,	-	0	0	4	,						
93	X	Y	,	+	0	0	4	,	+	0	0	4	,	P	V	,	+	0	0	4	,	+	0	3	1	,						
94	X	Y	,	+	0	0	4	,	+	0	3	1	,	P	V	,	+	0	0	9	,	+	0	3	0	,						
95	X	Y	,	+	0	0	9	,	+	0	3	0	,	P	V	,	+	0	1	4	,	+	0	2	8	,						
96	X	Y	,	+	0	1	4	,	+	0	2	8	,	P	V	,	+	0	1	9	,	+	0	2	5	,						
97	X	Y	,	+	0	1	9	,	+	0	2	5	,	P	V	,	+	0	2	5	,	+	0	1	9	,						
98	X	Y	,	+	0	2	5	,	+	0	1	9	,	P	V	,	+	0	2	8	,	+	0	1	4	,						
99	X	Y	,	+	0	2	8	,	+	0	1	4	,	P	V	,	+	0	3	0	,	+	0	0	9	,						
100	X	Y	,	+	0	3	0	,	+	0	0	9	,	P	V	,	+	0	3	1	,	+	0	0	4	,						
101	X	Y	,	+	0	3	1	,	+	0	0	4	,	P	V	,	+	0	0	4	,	+	0	0	4	*						
102	P	R	I	N	T															C	R	O	S	S		O	F		I	O	N	A
103	C	R	O	S	S		O	F		I	O	N	A																			
104	W	L	,	2	0	0	Q	.																								
105	M	A	,	-	6	2	5	,	+	6	2	5	.	0	0	0	0	,	1	8	8	0	,	I	S	,	0	,	8	,		
106	M	S	,	0	,	1	2	,	1	2	,	0	,	0	C	,	0	0	0	0	,	0	0	0	0	,						
107	M	S	,	0	,	1	2	,	1	2	,	0	,	X	Y	,	0	0	0	0	,	0	7	0	0	;						
108	N	J	X	N	V	P	P	N	G	E	(	3	2	)	Q	C	(	1	,	1	3	#	0	)	*						
109	F	R	A	M	E																											
110	/	*																														



CROSS OF IONA

SHODO

```
PRINT
**
WI,2000,
MA,-3125,+3125,00000,09600,
MS,0,1,1,0,
OC,00000,07000,X',0,0,
MS,0,10,10,0,
NJXNVPPN,=719,4724(32)QC(1,2#0)*
FNAME
/*
```

KMMCTN

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
																				C	O	M	M	U	N	I	C	A	T	I	O	N
1	P	R	I	N	T																											
2	I	n	v	i	+	a	+	i	o	n																						
3	M	A	,	-	3	1	2	5	,	+	3	1	2	5	,	0	0	0	0	0	,	0	9	6	0	0	,					
4	M	S	,	0	,	1	,	1	,	0	,																					
5	O	C	,	-	3	1	2	5	,	0	1	6	0	0	,	X	Y	,	0	,	0	,	W	L	,	2	0	0	Q	,		
6	M	S	,	0	,	7	,	7	,	0	,																					
7	N	J	X	N	V	P	P	N	C	S	(	3	2	)	Q	L	(	1	,	1	0	$	0	)	.							
8	E	C	O	N	O	M	Y																									
9	M	S	,	0	,	1	,	1	,	0	,																					
10	O	C	,	-	3	1	2	5	,	0	2	2	4	0	,	X	Y	,	0	,	0	,										
11	M	S	,	0	,	7	,	7	,	0	,																					
12	P	N	S	R	(	3	2	)	Q	L	(	1	,	7	$	0	)	.														
13	C	A	R	T	O	G	R	A	P	H	Y																					
14	M	S	,	0	,	1	,	1	,	0	,																					
15	O	C	,	-	3	1	2	5	,	0	2	8	8	0	,	X	Y	,	0	,	0	,										
16	M	S	,	0	,	7	,	7	,	0	,																					
17	P	N	K	R	(	3	2	)	Q	L	(	1	,	1	,	$	0	)	.													
18	G	r	a	m	m	a																										
19	M	S	,	0	,	1	,	1	,	0	,																					
20	O	C	,	-	3	1	2	5	,	0	3	5	2	0	,	X	Y	,	0	,	0	,										
31	M	S	,	0	,	7	,	7	,	0	,																					
22	P	N	C	G	(	3	2	)	Q	L	(	1	,	6	$	0	)	.														
23	G	r	a	f	i	k	a																									
24	M	S	,	0	,	1	,	1	,	0	,																					
25	O	C	,	-	3	1	2	5	,	0	+	1	6	0	,	X	Y	,	0	,	0	,										
26	M	S	,	0	,	7	,	7	,	0	,																					
27	3	8	0	4	,	3	9	1	7	,	2	9	0	1	,	2	9	2	1	,	2	9	0	9	,	2	9	1	1	,		
28	2	9	0	1	(	3	2	)	Q	L	(	1	,	7	$	0	)	.														
29	R	o	+	a	+	i	o	n																								
30	M	S	,	0	,	1	,	1	,	0	,																					
31	O	C	,	-	2	8	8	0	,	0	5	5	6	0	,	X	Y	,	0	,	0	,										
32	M	S	,	-	4	9	5	0	Q	,	+	4	9	5	0	Q	,	+	4	9	5	0	Q	,	+	4	9	5	0	Q	,		
33	P	N	S	R	(	3	2	)	Q	L	(	1	,	8	#	0	)	.														
34	S	y	l	l	a	b	a	r	y																							
35	M	S	,	0	,	1	,	1	,	0	,																					
36	O	C	,	-	3	1	2	5	,	0	6	3	6	0	,	X	Y	,	0	,	0	,										
37	M	S	,	0	,	7	,	7	,	0	,																					
38	P	N	C	R	(	3	2	)	Q	L	(	1	,	9	#	0	)	.														
39	A	r	t																													
40	M	S	,	0	,	1	,	1	,	0	,																					
41	O	C	,	-	3	1	2	5	,	0	7	0	0	0	,	X	Y	,	0	,	0	,										
42	M	S	,	0	,	7	,	7	,	0	,																					
43	P	N	G	E	(	3	2	)	Q	L	(	1	,	3	$	0	)	.														

```
   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
44 M e t e o r o l o g y
45 M S , 0 , 1 , 1 , 0 ,
46 O C , - 3 1 2 5 , 0 7 6 4 0 , X Y , 0 , 0 ,
47 M S , 0 , 7 , 7 , 0 ,
48 P I C I ( 3 2 ) Q L ( 1 , 1 1 # 0 ) .
49 C H E M I S T R Y
50 M S , 0 , 1 , 1 , 0 ,
51 O C , - 3 1 2 5 , 0 8 2 8 0 , X Y , 0 , 0 ,
52 M S , 0 , 7 , 7 , 0 ,
53 P N C R ( 3 2 ) Q L ( 1 , 9 # 0 ) .
54 A n a l y s i s
55 M S , 0 , 1 , 1 , 0 ,
56 O C , - 3 1 2 5 , 0 8 9 2 0 , X Y , 0 , 0 ,
57 M S , 0 , 7 , 7 , 0 ,
58 P N T I ( 3 2 ) Q L ( 1 , 8 # 0 ) .
59 C O M M U N I C A T I O N
60 M S , 0 , 1 , 1 , 0 ,
61 O C , 0 0 0 0 0 C , 0 1 6 0 0 , X Y , 0 , 0 ,
62 M S , 0 , 7 , 7 , 0 ,
63 P N P R ( 3 2 ) Q S ( 1 , 1 3 # 0 ) .
64 V E R S A T I L I T Y
65 M S , 0 , 1 , 1 , 0 ,
66 O C , 0 0 0 0 0 , 0 3 2 4 0 , X Y , 0 , 0 ,
67 M S , 0 , 7 , 7 , 0 ,
68 P N C H ( 3 2 ) Q C ( 1 , 1 1 # 0 ) .
69 S t a n d a r d i z a t i o n
70 M S , 0 , 1 , 1 , 0 ,
71 O C , 0 0 0 0 0 , 0 2 8 8 0 , X Y , 0 , 0 ,
72 M S , 0 , 7 , 7 , 0 ,
73 P N C R ( 3 2 ) Q C ( 1 , 1 5 # 0 ) .
74 S u m b o l o n
75 M S , 0 , 1 , 1 , 0 ,
76 O C , 0 0 0 0 0 , 0 3 5 2 0 , X Y , 0 , 0 ,
77 M S , 0 , 7 , 7 , 0 ,
78 P H C E ( 3 2 ) Q C ( 1 , 8 # 0 ) .
79 S L O Z N O S T X
80 M S , 0 , 1 , 1 , 0 ,
81 O C , 0 0 0 0 0 , 0 4 1 6 0 , X Y , 0 , 0 ,
82 M S , 0 , 7 , 7 , 0 ,
83 2 8 1 8 , 2 8 1 2 , 2 8 1 5 , 2 8 0 7 , 2 8 1 4 , 2 8 1 5 ,
84 2 8 1 8 , 2 8 1 9 , 2 8 3 7 ( 3 2 ) Q C ( 1 , 9 # 0 ) .
```

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
85	E	X	T	E	N	S	I	O	N																							
86	M	S	,	0	,	1	,	1	,	0	,																					
87	O	C	,	0	0	0	0	0	,	0	4	8	0	0	,	X	Y	,	0	,	0	,										
88	M	S	,	0	,	2	,	1	7	,	0	,																				
89	P	N	S	R	(	3	2	)	Q	C	(	1	,	9	#	0	)	.														
90	C	O	N	D	E	N	S	A	T	I	O	N																				
91	M	S	,	0	,	1	,	1	,	0	,																					
92	O	C	,	0	0	0	0	0	,	0	5	5	6	0	,	X	Y	,	0	,	0	,										
93	M	S	,	0	,	1	7	,	5	,	0	,																				
94	P	N	S	R	(	3	2	)	Q	C	(	1	,	1	2	#	0	)	.													
95	L	E	X	I	K	O	N																									
96	M	S	,	0	,	1	,	1	,	0	,																					
97	O	C	,	0	0	0	0	0	,	0	6	3	6	0	,	X	Y	,	0	,	0	,										
98	M	S	,	0	,	7	,	7	,	0	,																					
99	P	N	T	G	(	3	2	)	Q	C	(	1	,	7	#	0	)	.														
100	W	i	s	s	e	n	s	c	h	a	f	t																				
101	M	S	,	0	,	1	,	1	,	0	,																					
102	O	C	,	0	0	0	0	0	,	0	7	6	4	0	,	X	Y	,	0	,	0	,										
103	M	S	,	0	,	7	,	7	,	0	,																					
104	P	N	G	G	(	8	)	H	v		=	6	,	0	0	(	3	2	)	Q	C	(	1	,	1	2	#	0	)	.		
105	E	l	e	c	t	r	o	n	i	c	s																					
106	M	S	,	0	,	1	,	1	,	0	,																					
107	O	C	,	0	0	0	0	0	,	0	8	3	8	0	,	X	Y	,	0	,	0	,										
108	M	S	,	0	,	7	,	7	,	0	,																					
109	P	N	C	T	(	3	2	)	Q	C	(	1	,	1	1	#	0	)	.													
110	C	O	M	P	U	T	A	T	I	O	N																					
111	M	S	,	0	,	1	,	1	,	0	,																					
112	O	C	,	0	0	0	0	0	,	0	8	9	2	0	,	X	Y	,	0	,	0	,										
113	M	S	,	0	,	7	,	7	,	0	,																					
114	P	N	T	R	(	3	2	)	Q	C	(	1	,	1	1	#	0	)	.													
115	P	u	b	l	i	c	a	t	i	o	n																					
116	M	S	,	0	,	1	,	1	,	0	,																					
117	O	C	,	+	3	1	2	5	,	0	1	6	0	0	,	X	Y	,	0	,	0	,										
118	M	S	,	0	,	7	,	7	,	0	,																					
119	P	N	C	S	(	3	2	)	Q	R	(	1	,	1	1	#	0	)	.													
120	Q	u	a	l	i	t	y																									
121	M	S	,	0	,	1	,	1	,	0	,																					
122	O	C	,	+	3	1	2	5	,	0	2	2	4	0	,	X	Y	,	0	,	0	,										
123	M	S	,	0	,	7	,	7	,	0	,																					
124	P	N	G	E	(	3	2	)	Q	R	(	1	,	7	#	0	)	.														

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
125	T	Y	P	O	G	R	A	P	H	Y																						
126	M	S	,	0	,	1	,	1	,	0	,																					
127	O	C	,	+	3	1	2	5	,	0	2	8	8	0	,	X	Y	,	0	,	0	,										
128	M	S	,	0	,	7	,	7	,	0	,																					
129	P	N	K	R	(	3	2	)	Q	R	(	1	,	1	0	#	0	)	.													
130	A	r	i	g	m	o	s																									
131	M	S	,	0	,	1	,	1	,	0	,																					
132	O	C	,	+	3	1	2	5	,	0	3	5	2	0	,	X	Y	,	0	,	0	,										
133	M	S	,	0	,	7	,	7	,	0	,																					
134	P	N	C	G	(	6	)	2	1	8	7	(	3	2	)	Q	R	(	1	,	7	#	0	)	.							
135	F	o	n	e	t	i	k	a																								
136	M	S	,	0	,	1	,	1	,	0	,																					
137	O	C	,	+	3	1	2	5	,	0	4	1	6	0	,	X	Y	,	0	,	0	,										
138	M	S	,	0	,	7	,	7	,	0	,																					
134	2	8	2	1	,	2	9	1	5	,	2	9	1	4	,	3	9	0	6	,	2	9	1	9	,	2	9	0	9	,		
140	2	9	1	1	,	2	9	0	1	(	3	2	)	Q	R	(	1	,	8	#	0	)	.									
141	R	O	T	A	T	1	O	N																								
142	M	S	,	0	,	1	,	1	,	0	,																					
143	O	C	,	+	2	8	8	0	,	0	5	5	6	0	,	X	Y	,	0	,	0	,										
144	M	S	,	+	4	9	5	0	Q	,	-	4	9	5	0	Q	,	+	4	9	5	0	Q	,	+	4	9	5	0	Q	,		
145	P	N	S	R	(	3	2	)	Q	R	(	1	,	8	#	0	)	.														
146	A	l	p	h	a	b	e	t																								
147	M	S	,	0	,	1	,	1	,	0	,																					
148	O	C	,	+	3	1	2	5	,	0	6	3	6	0	,	X	Y	,	0	,	0	,										
149	M	S	,	0	,	7	,	7	,	0	,																					
150	P	N	C	R	(	3	2	)	Q	R	(	1	,	8	#	0	)	.														
151	M	u	s	i	c																											
152	M	S	,	0	,	1	,	1	,	0	,																					
153	O	C	,	+	3	1	2	5	,	0	7	0	0	0	,	X	Y	,	0	,	0	,										
154	M	S	,	0	,	7	,	7	,	0	,																					
155	P	N	E	I	(	3	2	)	Q	R	(	1	,	5	#	0	)	.														
156	A	s	t	r	o	n	o	m	y																							
157	M	S	,	0	,	1	,	1	,	0	,																					
158	O	C	,	+	3	1	2	5	,	0	7	6	4	0	,	X	Y	,	0	,	0	,										
159	M	S	,	0	,	7	,	7	,	0	,																					
160	P	I	C	R	(	3	2	)	Q	R	(	1	,	9	#	0	)	.														
161	M	A	T	H	E	M	A	T	1	C	S																					
162	M	S	,	0	,	1	,	1	,	0	,																					
163	O	C	,	+	3	1	2	5	,	0	8	2	8	0	,	X	Y	,	0	,	0	,										
164	M	S	,	0	,	7	,	7	,	0	,																					
165	P	N	C	R	(	3	2	)	Q	R	(	1	,	1	1	#	0	)	.													

```
166 Program
167 MS,0,1;1,0,
168 OC,+3125,08920,XY,0,0,
169 MS,0,7,7,0,
170 PNTI(32)QR(1,7#0)*
171 FRAME
172 /*
```

Invitation COMMUNICATION *Publication*

ECONOMY *VERSATILITY* **Quality**

CARTOGRAPHY Standardization TYPOGRAPHY

Γραμμα Συμβολου Αριθμος

Графика СЛОЖНОСТЬ Фонетика

EXTENSION

Rotation CONDENSATION ROTATION

Syllabary ΛΕΞΙΚΟΝ Alphabet

Art 書道 **Music**

Meteorology **Wissenschaft** **Astronomy**

CHEMISTRY *Electronics* MATHEMATICS

Analysis COMPUTATION *Program*

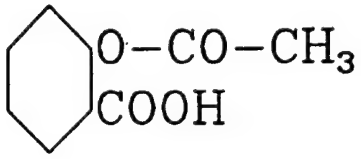
ANLGSX

```
1  PRINT                                                    ANALGESICS
2  ANALGESICS
3  MA,-380,+380,0000,1200,
4  IS,0,8,WL,200Q,
5  MS,0,8,8,0,OC,0000,0250,
6  MS,0,8,8,0,XY,0000,0000,
7  NJXNVPPNTR(32)QC(1,10$0)*
8  PRINT                                                    ASPIRIN
9  /1\/1\0-CO-CH3COOH
10 OC,-028,0400,
11 XY,-28,-34,0797,
12 XY,-28,0,0798,
13 XY,-28,+34,0799,
14 XY,0,+34,0797,
15 XY,+28,0,0798,
16 XY,0,-34,0799,
17 XY,+30,-20,
18 PNCR(13)SB(14)PN
19 XY,+30,+20,PNCR(32).
20 Aspirin
21 XY,0000,+100,PNTI(32)
22 QC(1,7$+28)*
```

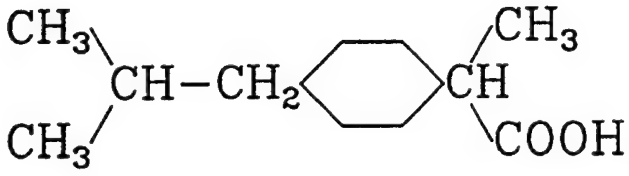
```
      1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
                                                                        I  B  U  P  R  O  P  H  E  N
23    P  R  I  N  T
24    C  H  3  \  *  C  H  3  /  *  *  C  H  -  C  H  2
25    O  C  ,  +  0  4  8  ,  0  6  5  0  ,
26    X  Y  ,  0  0  0  ,  -  3  8  ,  P  N  C  R  (  2  )  S  R  (  3  )  P  N
27    X  Y  ,  -  3  2  ,  -  2  6  ,  0  8  0  4  ,
28    X  Y  ,  0  0  0  ,  0  0  0  ,  N  X
29    X  Y  ,  0  0  0  ,  +  3  8  ,  P  N  C  R  (  7  )  S  R  (  8  )  P  N
30    X  Y  ,  -  2  2  ,  +  2  6  ,  0  8  0  2  ,
31    X  Y  ,  0  0  0  ,  0  0  0  ,  N  X
32    N  X  ,  P  N  C  R  (  1  6  )  S  R  (  1  7  )  P  N  (  3  2  )
33    Q  R  (  1  ,  3  /  4  )  Q  R  (  6  ,  8  /  9  )  Q  C  (  1  1  /  1  2  )
34    Q  R  (  1  ,  5  /  1  1  )  Q  R  (  6  ,  1  0  /  1  1  )
35    Q  R  (  1  ,  1  7  #  -  0  4  8  )  .
36    \  =  /  \  =  /
37    X  Y  ,  -  4  8  ,  +  1  4  ,  0  7  9  9  ,
38    X  Y  ,  -  3  0  ,  +  2  8  ,  0  7  9  6  ,
39    X  Y  ,  +  2  0  ,  +  1  4  ,  0  7  9  7  ,
40    X  Y  ,  +  2  0  ,  -  1  4  ,  0  7  9  9  ,
41    X  Y  ,  -  2  0  ,  -  2  8  ,  0  7  9  6  ,
42    X  Y  ,  -  4  8  ,  -  1  4  ,  0  7  9  7  ,  P  N  C  R  (  3  2  )  .
43    C  H  *  *  /  C  H  3  *  \  C  O  O  H
44    X  Y  ,  0  0  0  ,  0  0  0  ,  P  N  C  R  (  2  )
45    X  Y  ,  0  0  0  ,  0  0  0  ,  N  X
46    X  Y  ,  0  0  0  ,  0  0  0  ,  N  X
47    X  Y  ,  +  8  ,  -  2  6  ,  0  8  0  3  ,
48    X  Y  ,  0  0  0  ,  -  3  8  ,  P  N  C  R  (  7  )  S  R  (  8  )  P  N
49    X  Y  ,  0  0  0  ,  0  0  0  ,  N  X
50    X  Y  ,  +  8  ,  +  2  6  ,  0  8  0  4  ,
51    X  Y  ,  0  0  0  ,  +  3  8  ,  P  N  C  R  (  3  2  )
52    Q  L  (  6  ,  8  /  5  )  Q  L  (  1  1  ,  1  4  /  1  0  )  Q  C  (  3  /  1  )
53    Q  L  (  4  ,  8  /  3  )  Q  L  (  9  ,  1  4  /  3  )
54    Q  L  (  1  ,  1  4  #  +  4  8  )  .
55    l  b  u  p  r  o  f  e  n
56    X  Y  ,  0  0  0  0  ,  +  1  0  0  ,  P  N  T  I  (  3  2  )
57    Q  C  (  1  ,  9  $  -  4  8  )  *
```

```
   1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
58 P  R  I  N  T                                                  A  C  E  T  A  M  I  N  O  P  H  E  N
59 C  H  3  -  C  O  -  N  H  \  =  /  \  =  /  O  H
60 O  C  ,  +  0  4  8  ,  0  9  0  0  ,
61 X  Y  ,  0  0  0  ,  0  0  0  ,  P  N  C  R  (  2  )  S  B  (  3  )  P  N  (  9  )
62 Q  R  (  1  ,  9  #  -  0  4  8  )
63 X  Y  ,  -  4  8  ,  +  1  4  ,  0  7  9  9  ,
64 X  Y  ,  -  2  0  ,  +  3  8  ,  0  7  9  6  ,
65 X  Y  ,  +  2  0  ,  +  1  4  ,  0  7  9  7  ,
66 X  Y  ,  +  2  0  ,  -  1  4  ,  0  7  9  9  ,
67 X  Y  ,  -  2  0  ,  -  3  8  ,  0  7  9  6  ,
68 X  Y  ,  -  4  8  ,  -  1  4  ,  0  7  9  7  ,
69 X  Y  ,  0  0  0  ,  0  0  0  ,  P  N  C  R  (  3  2  )
70 Q  L  (  1  6  ,  1  7  $  +  0  4  8  )  .
71 A  c  e  t  a  m  i  n  o  p  h  e  n
72 X  Y  ,  0  0  0  0  ,  +  1  0  0  ,  P  N  T  I  (  3  2  )
73 Q  C  (  1  ,  1  3  $  -  4  8  )  *
74 P  R  I  N  T                                                                  R  E  F  E  R  E  N  C  E
75 R  e  f  e  r  e  n  c  e  :     T  h  e     M  e  r  c  k     I  n  d  e  x
76 M  A  ,  -  6  0  0  ,  +  6  0  0  ,  0  0  0  0  ,  1  9  2  0  ;
77 T  S  ,  0  ,  8  ,  W  L  ,  1  2  8  0  ,
78 M  S  ,  0  ,  5  ,  5  ,  0  ,  0  ,  ,  0  0  0  0  ,  1  3  4  0  ,
79 M  S  ,  0  ,  5  ,  5  ,  0  ,  X  Y  ,  0  0  0  0  ,  0  0  0  0  ,
80 P  N  C  R  (  1  0  )  P  N  C  T  (  3  6  )  P  N  C  R  (  3  2  )
81 Q  C  (  1  2  6  $  0  )  *
82 F  R  A  M  E
83 /  *
```

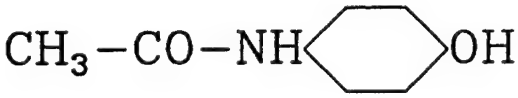
ANALGESICS



Aspirin



Ibuprofen



Acetaminophen

Reference: *The Merck Index*

RELTIV

```
PRINT                                                   RELATIVITY
RELATIVITY
MA,-762,+762,0400,2400,
IS,0,8,WL,100Q,
MS,0,4,4,0,OC,0000,0400,
MS,0,4,4,0,XY,0000,0000,
NJXNVPPNCR(32)QC(1,10#0).
    That the velocity of light
HV,000,020,AJCR(32).
is independent of the motion of
(32).
the observer was indicated
(32).
first by the experiments of
2178,NX(32).
Michelson and Morley. The
(32).
constancy of the velocity of
(32).
light is only one manifestation
(32).
of the principle of relativity,
(32).
which may be stated in the
(32).
following way.
(32)NJ.
    It is not possible by any
HV,000,020,AJCI(32).
physical experiment to
(32).
determine an absolute motion
(32).
through space.
(32)NJ.
    An implication of the
HV,000,020,AJCK(32).
principle of relativity is that
(32).
all scalars, vectors, and
(32).
tensors which represent
(32).
```

physical quantities are
(32).
invariant with respect to the
(32).
velocity of the reference frame
(32).
to which they are referred.
(32)NJ.
Let a spherical light wave
AJCR(32).
emanate from an origin of
(32).
coordinates at zero time and
(32).
expand with the speed of light.
(32).
The equation of the light wave
(32).
is
(32)NJ.
$x^2 + y^2 + z^2 - c^2t^2 = 0$ (1)
HV,000,+20,XHVP,
PNCT(1)SP(2)PN(6)SP(7)PN(11)
SP(12)PN(16)SP(17)PN(18)SP(19)
PN(32)QC(1,2390)QR(30,32$762).
where x, y, z, t are the
HV,000,+20,XNVP,
AJCR(6)CI(8)2198(11)2198(14)
2198(16)CR(32).
Cartesian coordinates and the
(32).
time of a point in the light
(32).
wave and c is the speed of
(9)CI(10)CR(32).
light. Invariance of the scalar
(32).
function in Equation (1)
(20)2198(32).
implies that a position vector
(32).
r with coordinates
GF(1)PNCR(32)NJ.

```
(x, y, z, ict)                                                    (2)
HV,000,+20,XHVP,
PNCI(32)
QC(1,14$0)QR(30,32$762).
is invariant in a
HV,000,+20,XNVP,
AJCR(32).
four-dimensional space whose
(32).
metric is given by the equation
(32)NJ.
dl2 = dx2 + dy2 + dz2 - c2dt2 (3)
HV,000,+20,XHVP,
PNCI(2)SP(3)PN(8)SP(9)PN(14)
SP(15)PN(20)SP(21)PN(25)SP(26)
PN(28)SP(29)PNCR(32)QC(1,29$0)
QR(30,32$762).
The vector r may be
HV,000,+20,XNVP,
AJCR(11)GE(12)PNCR(32).
differentiated with respect to
(2)2177,NX(32).
the metric l to obtain new
(11)CI(12)CR(32).
invariants which satisfy the
(32).
identity
(32)NJ.
d/dl(dr/dl*dr/dl) =
HV,000,+42,XHVP,
PNCI(4)VQ(5)VP(6)GE(7)PNCI(10)
VQ(11)VP(12)GE(13)PNCI(16)
VQ(17)VPCR(32)
DV(1/3,4)DV(6,7/9,10)
DV(12,13/15,16)QR(1,20$0).
2 dr/dl*d2r/dl2 = 0                                               (4)
HV,000,-40,XHVP,
PNCI(3)GE(4)PNCI(7)VQ(8)VP(9)
SP(10)PNGE(11)PNCI(14)SP(15)
PNCR(32)
DV(3,4/6,7)DV(9,11/13,15)
QL(1,19$0)QR(30,32$762).
```

Associated with a particle

HV,000,+48,XNVP.

AJCR(32).

is a rest mass mo which is a

(15)CI(16)SB(17)PNCR(32).

physical quantity and is.

(32).

invariant by the principle of

(32).

relativity. Associated with the

(32).

particle is a momentum vector p

(30)GE(31)PNCR(32).

which may be defined by the

(15)2178,NX(32).

equation

(32)NJ.

p = imoc dr/dl (5)

HV,000,+48.XHVP.

PNGE(1)PNCI(6)SB(7)PN(10)GE(11)

PNCI(14)CR(32)DV(10,11/13,14)

QC(1,14.50)QR(30,32#752).

Application of the Identity (4)

HV,000,+48,XNVP.

AJCR(32).

to the momentum vector p leads

(23)GE(24)PNCK(32).

to Einstein's law of the

(11)VQ(12)VP(..).

equivalence of mass and energy.

(32).

The prediction of the

(32).

equivalence of mass and energy

(32).

is one theory which has been

(32).

confirmed in the most

(3)2178,NX(32).

spectacular way by practical

(32).

applications. It gives the
(32).
source of energy for nuclear
(32).
bombs.
(32)NJ.
A vital application of
(32)AJ.
relativity is to chemical
(32).
structure. That electrons move
(32).
as though they have spin was
(32).
discovered when relativity was
(32).
applied to the motion of
(32).
electrons by Dirac. The two
(32).
electrons in a chemical bond
(32).
are locked together by opposite
(32).
spins. Inasmuch as we are held
(32).
together by chemical bonds, we
(32).
would not even exist if there
(32).
were no relativity.
(32)NJ*
FRAME
/*

RELATIVITY

That the velocity of light is independent of the motion of the observer was indicated first by the experiments of Michelson and Morley. The constancy of the velocity of light is only one manifestation of the principle of relativity, which may be stated in the following way.

It is not possible by any physical experiment to determine an absolute motion through space.

An implication of the principle of relativity is that all scalars, vectors, and tensors which represent physical quantities are invariant with respect to the velocity of the reference frame to which they are referred.

Let a spherical light wave emanate from an origin of coordinates at zero time and expand with the speed of light. The equation of the light wave is

$$x^2 + y^2 + z^2 - c^2t^2 = 0 \tag{1}$$

where x, y, z, t are the Cartesian coordinates and the time of a point in the light wave and c is the speed of light. Invariance of the scalar function in Equation (1) implies that a position vector $\mathbf{r}$ with coordinates

$$(x, y, z, ict) \tag{2}$$

is invariant in a four-dimensional space whose metric is given by the equation

$$dl^2 = dx^2 + dy^2 + dz^2 - c^2dt^2 \tag{3}$$

The vector $\mathbf{r}$ may be differentiated with respect to the metric l to obtain new invariants which satisfy the identity

$$\frac{d}{dl}\left(\frac{d\mathbf{r}}{dl}\cdot\frac{d\mathbf{r}}{dl}\right) = 2\,\frac{d\mathbf{r}}{dl}\cdot\frac{d^2\mathbf{r}}{dl^2} = 0 \tag{4}$$

Associated with a particle is a rest mass m_0 which is a physical quantity and is invariant by the principle of relativity. Associated with the particle is a momentum vector $\mathbf{p}$ which may be defined by the equation

$$\mathbf{p} = im_0c\,\frac{d\mathbf{r}}{dl} \tag{5}$$

Application of the Identity (4) to the momentum vector $\mathbf{p}$ leads to Einstein's law of the equivalence of mass and energy. The prediction of the equivalence of mass and energy is one theory which has been confirmed in the most spectacular way by practical applications. It gives the source of energy for nuclear bombs.

A vital application of relativity is to chemical structure. That electrons move as though they have spin was discovered when relativity was applied to the motion of electrons by Dirac. The two electrons in a chemical bond are locked together by opposite spins. Inasmuch as we are held together by chemical bonds, we would not even exist if there were no relativity.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

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